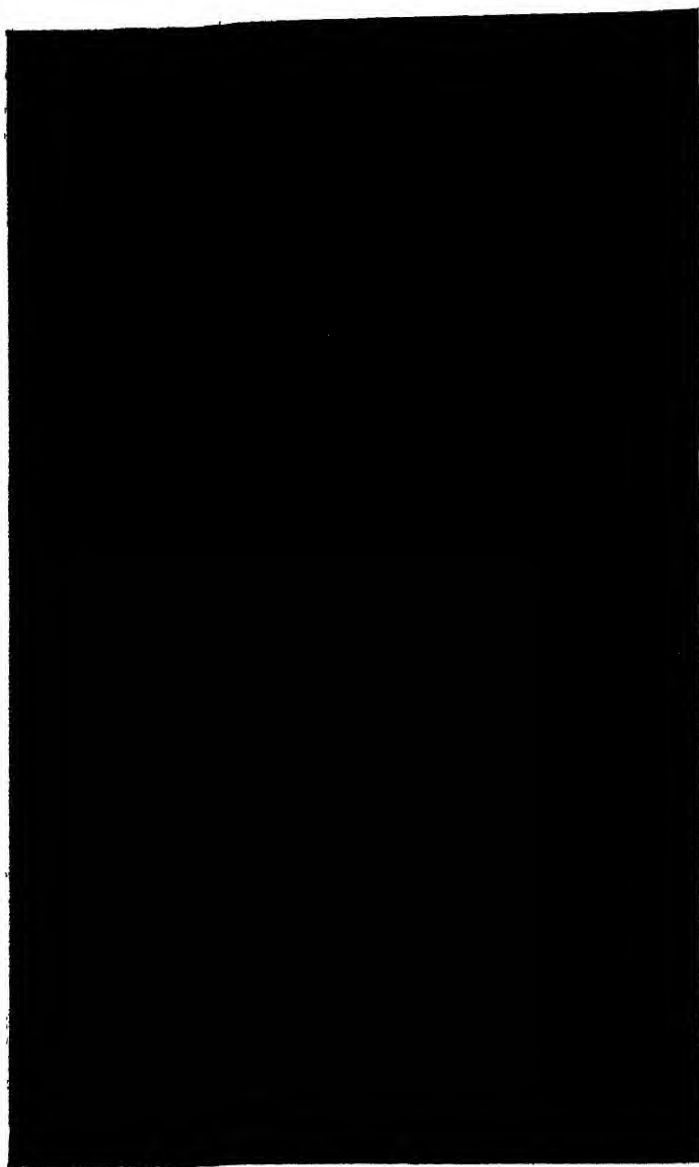


DISEASES OF THE
THROAT, NOSE, AND EAR

*Published by the Joint Committee of Henry Frowde
and Hodder & Stoughton, at the Oxford Press
Warehouse, Falcon Square, London, E.C.*



TRANSILLUMINATION IN A CASE OF EMPYEMA OF THE LEFT
MAXILLARY ANTRUM.

Frontispiece.

DISEASES OF THE THROAT, NOSE, AND EAR

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LONDON

HENRY FROWDE

HODDER & STOUGHTON

OXFORD UNIVERSITY PRESS

WARWICK SQUARE, E.C.

1915

PRINTED IN GREAT BRITAIN BY
MORRISON & GIBB LTD., TANFIELD, EDINBURGH

PREFACE.

SEEING the very large extent of the ground which has to be covered in a small work such as this, it has been thought best to omit from the text nearly all reference to authorities : to mention every one is impossible, to name some and omit others equally important would appear invidious. The work, however, of Thomson, Hill, Tilly, M'Bride, Wright, Harmer, Wingrave, Horne, Lake, Lack, Scott, Porter, Politzer, Killian, Gray, Semon, Grünwald, amongst other European surgeons, has been studied, together with that of the celebrated Transatlantic Otologists and Laryngologists.

An attempt has been made to make the book as concise and practical as possible, carefully avoiding anything like padding, but highly important points have sometimes been emphasised by repetition. The author, whilst agreeing with those who consider that chapters on Anatomy and Physiology are superfluous, yet thinks that experience has shown that refreshing the memory with a few important points is both grateful and useful to medical men, especially as regards the ear. This book has been written for general practitioners and senior students, and so full details are given as regards such proceedings as the doctor himself usually undertakes, *e.g.* the removal of cerumen : but to those which he generally passes on to the specialist, *e.g.* the Mastoid operation, only brief reference is made. The illustrations have chiefly been drawn by E. M. K. from rough sketches of cases and from

PREFACE

preparations in my possession. Mr. T. Cushing, Pharmacist, has kindly revised the prescriptions in the Appendix. I am indebted to several of the leading instrument makers, particularly Messrs. Mayer & Meltzer, for blocks of their instruments.

W. H. K.

LONDON, 1915.

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DISEASES OF THE THROAT, NOSE, AND EAR.

INSTRUMENTS.

ONE of the first questions asked by a practitioner about to devote his special attention to laryngology, rhinology, and otology is, What instruments and apparatus shall I require? So, an attempt will be made to briefly answer this question, limiting the list, however, to those things which are really necessary, others can always be added; but experience has taught the author the folly of recklessly buying complicated and expensive instruments very rarely used and soon out of date. In making one's selection those which are simple, readily cleaned, and not liable to easily get out of order, should be preferred; complex machines, such, for example, as some nasal snares, though working beautifully when new, are very apt to be out of gear just when wanted. One word as regards price. Although the prices of many surgical instruments, as listed by the best makers, often strike one as allowing a liberal margin of profit, yet experience shows that cheaper ones so often break, bend, or fit badly that they severely handicap the surgeon, who finds in the end that it is false economy to buy them.

Naturally, at different schools somewhat different instruments are recommended, and it must not be inferred that the author, by omitting certain forms from the list, by any means necessarily condemns them: as a matter of fact, he only

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recommends those which in his own personal experience have proved satisfactory.

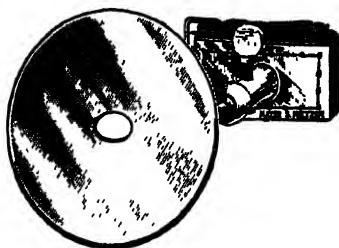


FIG. 1.—HEAD MIRROR.

This, being the doctor's almost constant companion, deserves special consideration. It should be about $3\frac{1}{2}$ inches in diameter and have a focus of about 9 inches. In the centre an oval opening is made about half an inch in its long axis, which is horizontal. A large opening is an advantage, in that it is easier to see through, particularly when the mirror has to be turned very obliquely owing to an awkward position of the light. The mirror is attached to a frame, and of these frames there are two chief varieties: first, those hooking behind the ears like a pair of spectacles; the second provided with a band either of rigid material, which, when adjusted, fits on the head like a hat, or of soft material, such as webbing, fixed by a buckle. Personally, I prefer those with a band, as I have found the other kind make the ears sore behind. Those who wear glasses must select a mirror with a frame which does not interfere. Particularly for operative work a head lamp—the electric current for which is supplied from a dry cell, accumulator, or through a resistance—has great advantages.

Unfortunately the head mirror cannot well be sterilised by heat, as most of the other instruments can, but easily sterilisable clips can be bought which may be fixed on so that when operating the clean hands of the surgeon need not touch the mirror itself.

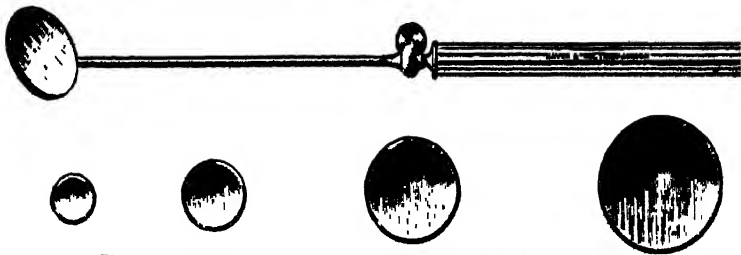


FIG. 2.—SMALL LARYNGOSCOPIC MIRRORS FIXED IN HANDLES.

It is desirable to have at least four of these, of 6, 10, 14, 18 mm. in diameter respectively; the smaller ones are used for children and for examining the post-nasal space and anterior portion of the vestibule of the nose.

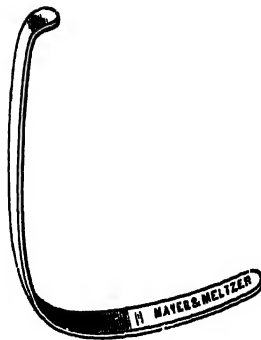


FIG. 3.—TONGUE SPATULE (Lack's).—Large and small.

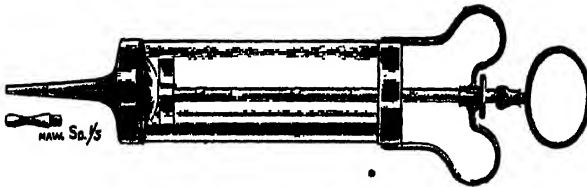


FIG. 4.—FOUR-OUNCE GLASS AND METAL SYRINGE.



FIG. 5.—BAYONET-SHAPED PROBE FOR THROAT AND NOSE.

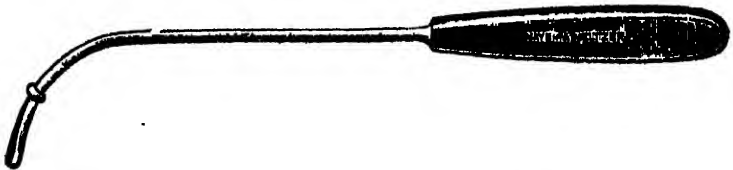


FIG. 6.—SWAB-HOLDER FOR PHARYNX, LARYNX, AND POST-NASAL SPACE (Kelson's).



FIG. 7.—NASAL SPECULUM (Thudicum's).—Large and small sizes.

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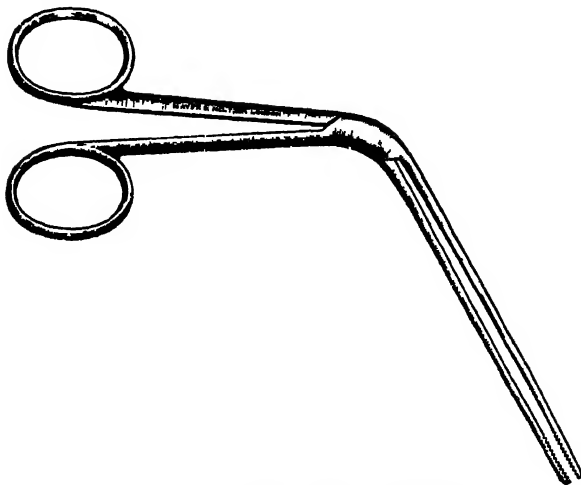


FIG. 8.—ANGULAR NASAL FORCEPS.

These may also be used for aural work, but it is necessary to make sure that the blades are sufficiently narrow to allow them to be used in conjunction with the small-sized aural speculum.



FIG. 9.—ACID APPLICATOR WITH PLATINUM LOOP.

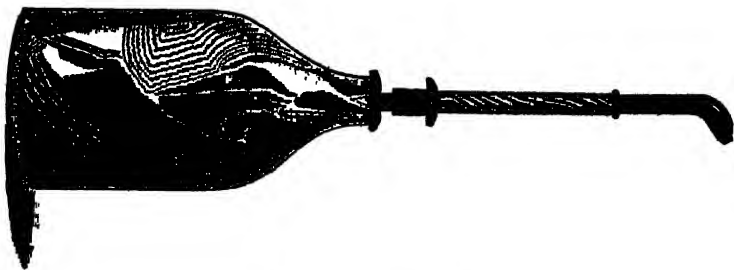


FIG. 10.—POLTZER BAG.

Bottle-shaped, with separate mount for Eustachian catheter.



FIG. 11.—AUSCULTATION TUBE.

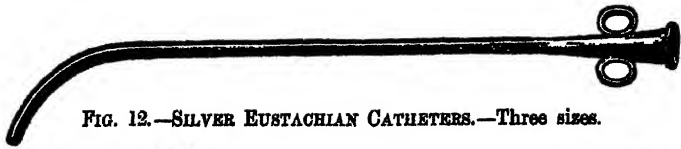


FIG. 12.—SILVER EUSTACHIAN CATHETERS.—Three sizes.

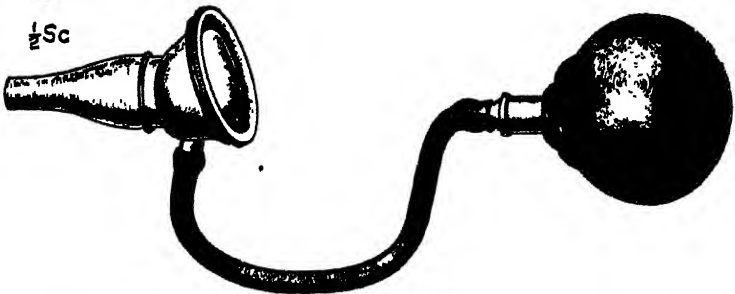


FIG. 13.—SIEGLE'S SPECULUM (Peter's metal variety), with four detachable aural specula (Gruber's pattern).

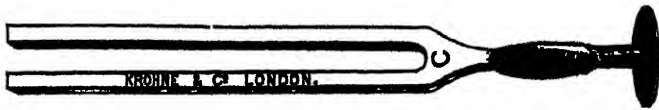


FIG. 14.—TUNING-FORK, C.

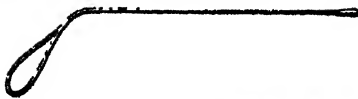


FIG. 15.—AURAL PROBE (Tod's).

If the practitioner proposes to do minor operations additional instruments will be required, *e.g.*:

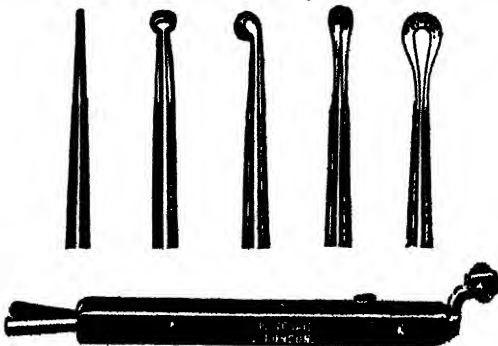


FIG. 16.—GALVANO-CAUTERY CORDS, HANDLE (Scheck's), AND POINTS.

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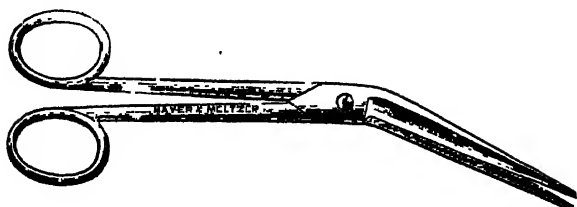


FIG. 17.—NASAL SCISSORS (Panza's).



FIG. 18.—ADENOID CURETTE (Beckmann's).

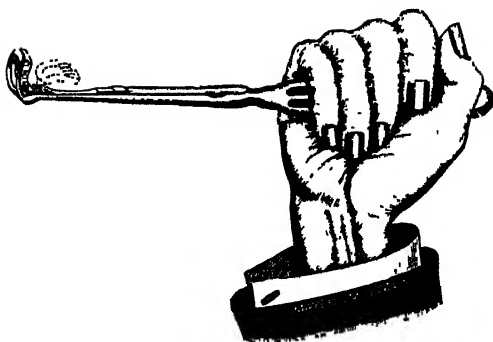


FIG. 18A.—THOMPSON'S MODIFICATION, with cage.

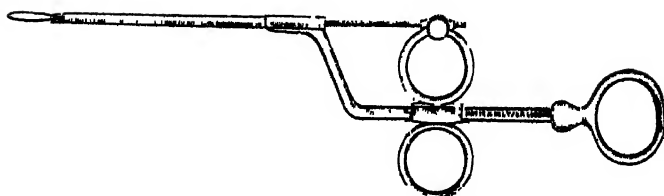


FIG. 19.—NASAL SNARE (Glegg's).

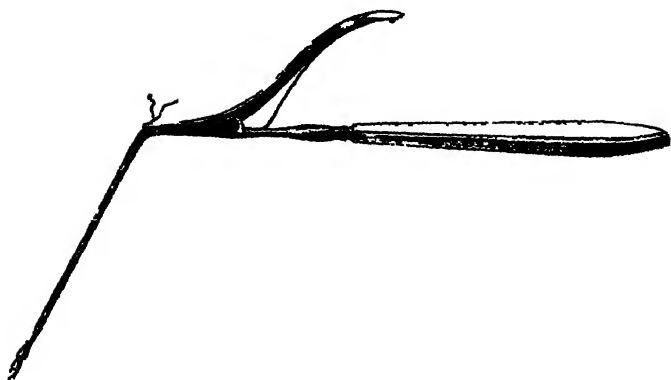


FIG. 20.—AURAL SNARE (Keen's).

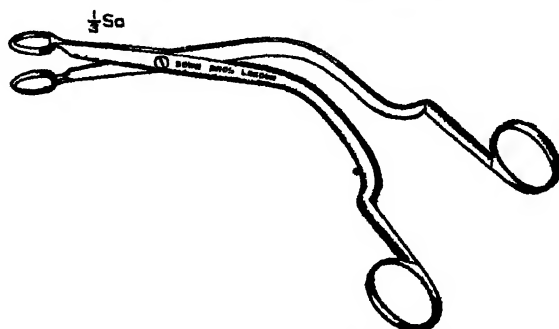


FIG. 21.—NASAL FORCEPS (Luc's).



FIG. 22.—PUNCH FORCEPS (Grünwald's).

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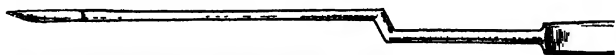


FIG. 23.—TYMPANIC KNIFE (Trautmann's).



FIG. 24.—TONSIL KNIFE (Mackenzie's).

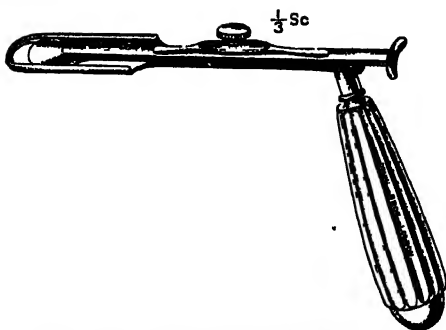


FIG. 25.—TONSILOTOME (Mackenzie's).

Also an apparatus for supplying electricity for the cautery and for the small lamps used in transillumination. Various kinds are on the market, and the exact form it will be best to use will vary with the district in which the doctor practises, and the frequency with which it will be required.

If one could always have sunlight for purposes of examination the necessity for artificial light would but rarely arise. But considering the fact that daylight is very often not available at times and in places where an illuminant is required one is obliged to seek for some other source, and this will vary with the resources of the neighbourhood. Electric light is the favourite, especially the Nernst lamp, but gas or oil do very well for most cases. It is very desirable when watching a case, such, for instance, as acute pharyngitis, to, as far as possible, always use the same kind of light, for it is surprising how very different in colour the parts appear when examined, the sources of light being different; a wrong impression may be thus easily obtained.

I.

THE THROAT.

SUPPOSING, now, the surgeon is seated, with his patient also seated in front of him, his knees being between those of the examiner; on the patient's left, and at about on a level with his ear is a bull's-eye lamp, whilst on the examiner's forehead is a reflector in the shape of a concave mirror.

The lamp, the head of the surgeon, and the patient all being at rest the former brings the opening in the centre of the reflector opposite to his right eye, so that he can easily see through it, and then gradually turns the mirror till the light, which at first moves about over the walls, ceiling, or elsewhere, in a puzzling way, becomes focused on the patient's lips.

The patient is now requested to widely open his mouth, and if any tooth plates be present it is better that they be removed. The tongue spatula is now introduced and swept round between the cheeks and lips on the one side and the teeth on the other, the surgeon noting the condition of these latter and the gums, and incidentally the opening of Stenson's duct from the parotid opposite the second upper molar on either side: and as regards the teeth one must urge the extreme importance of having any septic condition here put right, especially before commencing operative treatment on the throat, nose, or ear, except in urgent cases. Dental disease has such important bearings on affections of these organs that it must always be thought of and dealt with at the earliest possible opportunity. The under surface of the

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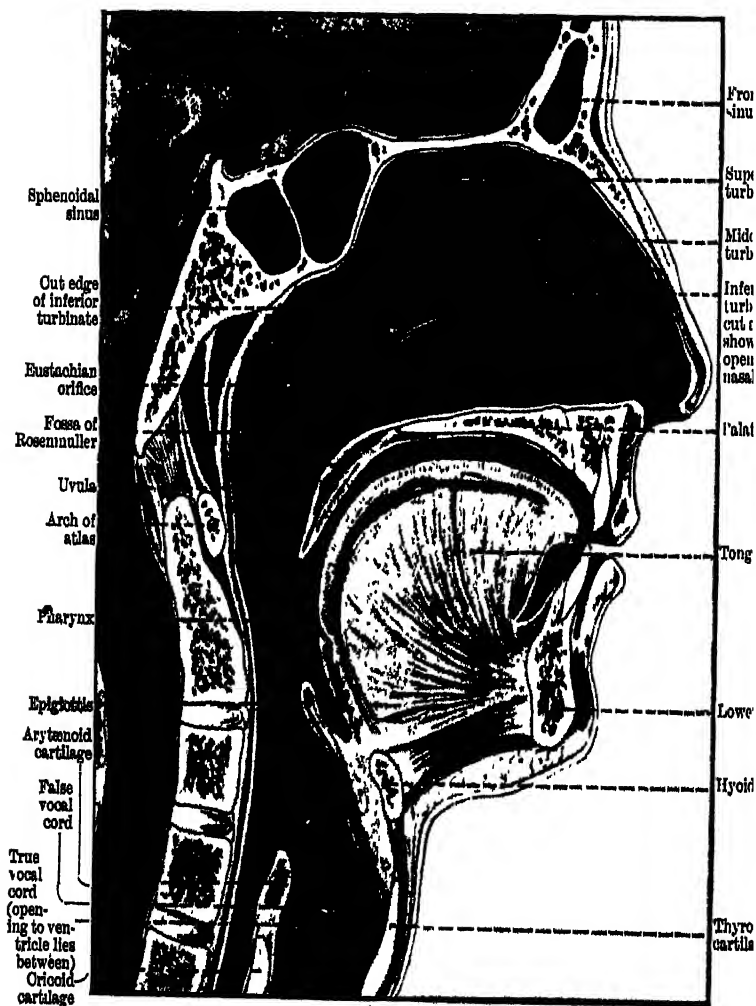


FIG. 26.—ANTERO-POSTERIOR VERTICAL SECTION (a little to the left of the middle line).

tongue, with the region on either side of the frenum ~~where~~^{near} Wharton's ducts open, is observed. The condition of the dorsum of the tongue should now be noted, and should any unusual appearance be presented it is a good plan to dry the surface with a cloth, as this often helps to clear up a doubtful diagnosis. It may be possible to obtain a good view of the upper pharynx without the use of a spatula, but generally this instrument has to be used, and its tip should be lightly applied to about the centre of the dorsum; if this is not sufficient, firm pressure must be made, and it is wonderful how much the tongue, which is a very muscular organ, will stand without inconvenience: if, however, the spatula be placed or slip too far back, retching is almost sure to occur.

We see now in the middle line, from before backwards, the hard palate, soft palate, and uvula, with the pharyngeal wall behind, whilst laterally we have the anterior pillars of the fauces, tonsils, posterior pillars, and behind them the lateral bands of the pharynx, consisting largely of lymphoid follicles.

In making this general examination any striking abnormality will be detected, such as an ulceration of the palate or inequality of its arches, elongation of the uvula, granular patches on the pharyngeal wall, enlargement of the pharyngeal bands, perforations of the pillars of the fauces, enlargement of the tonsils, or the pulsation of abnormally placed arterics.

To see the movements of the palate the patient should be made to say ah! when, if conditions be normal, the uvula will be drawn up in about the middle line, and reflex movements are set up if the soft palate be stroked with a probe.

The tonsil on either side, with its follicles, must be carefully noted, also the pit in its upper part, termed the tonsillar fossa, more or less concealed by a fold, the plica semilunaris, whilst running downwards and backwards from the anterior pillar of the fauces is another fold, the plica triangularis, which seems to sling up the lower part of the tonsil, of which

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it really forms part. On its deep surface the tonsil has a connective-tissue capsule separating it from the pharyngeal muscles; below it is more or less continuous with the lingual tonsil. Developmentally the faucial tonsil arises in the dorsal diverticulum of the second pharyngeal cleft.

At the back of the tongue can generally be seen the circumvallate papillæ arranged in a V-shape, with its apex backwards; they are interesting because inquisitive, and nervous patients sometimes discover them and fancy themselves to be suffering from a new growth.

A small laryngeal mirror may now be warmed and introduced (for method see p. 49) and passed backwards till close to the pharyngeal wall, its bright surface being directed upwards, the tongue being held down meanwhile with a spatula. The posterior surface of the palate and uvula can now be seen, and on turning the mirrored surface downwards the base of the tongue, the papillæ, and the lingual tonsil; between these two last lies the small depression called the foramen cæcum, the importance of which lies in its being the upper extremity of a foetal structure named the thyro-lingual duct. Just behind the lingual tonsil lies the median glosso-epiglottic fold, with a depression called the vallecula on either side of it.

Before passing on, it may be well to remind the practitioner of certain appearances sometimes seen in the mouth which may be considered as on the borderland of our special department, and these form pitfalls in which one sees able but unwary men sometimes badly trapped. Some of the more notable of these are: Koplik's spots of measles, small red spots with minute white apices on the mucous membrane of the cheek opposite the molar teeth, the small hard papules becoming vesicular of small-pox, the raised red spots becoming vesicular of chicken-pox, the strawberry tongue of scarlet fever, the small vesicles of herpes, with its stages of congestion, vesiculation, and excoriation, an appearance as of false membrane being sometimes produced, also the big

bullæ of pemphigus, the flat-topped papules of lichen planus, leucoplakia or white patches on the cheeks or tongue, often, but not always, syphilitic, furrowed tongue, and black or hairy tongue, both innocent conditions.

It is not a bad plan as a finale to excite slight retching



FIG. 27.—HOW TO HOLD A REBELLIOUS CHILD.

movements by touching the back of the tongue, as these movements bring into view parts, especially of the tonsils, not previously visible.

As regards the examination of children, a fractious child is capable of giving a great deal of trouble, but this may be minimised by having him held by an experienced nurse in the manner shown in the illustration. If the child resolutely

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declines to open his mouth the anterior nares should be held closed until he is forced to open, when a view can be obtained; if a more prolonged examination is necessary a gag must be used. If it be necessary to make a digital examination, the child having been induced to open his mouth, the



FIG. 28.—DIGITAL EXAMINATION OF THE NASO-PHARYNX.

surgeon standing on his right side, with his left arm encircling the child's neck, presses its left cheek in between its teeth with his left forefinger, and then introduces his right forefinger into the mouth. By this manoeuvre, should the patient show biting propensities, he will only make things very unpleasant for himself. This method, however, should only

be used when absolutely necessary, as it leaves a most disagreeable impression on the child's mind and generally makes him very difficult to deal with afterwards.

THE PHARYNX.

ACUTE PHARYNGITIS.

Acute pharyngitis is a common affection, due to a variety of causes: cold, damp, the fevers, especially scarlet, certain drugs, as mercury, belladonna, and arsenic; burns from hot liquids and corrosive substances; also operations; or as a manifestation of rheumatism, syphilis, or gout. The symptoms may be very slight—in fact, the patient may merely feel a little out of sorts, and the throat sore on swallowing; or there may be chilliness and a rise of 1° or 2° of temperature, with aching of the limbs, constipation, and general malaise; the throat feels sore and dry, and there may be cough. The voice or the hearing may respectively be affected, according as to whether the inflammation extends downwards to the larynx or upwards to the post-nasal space. On examination the pharyngeal wall is seen to be swollen and congested, and this also generally applies to the tonsils and the uvula. The parts are generally dry or covered with a little sticky mucus. Seeing how many important diseases begin with sore throat, it is very necessary, particularly as regards children, to watch the case most carefully.

Treatment.—For cases other than the mildest, the patient should promote perspiration by means of a hot bath, followed by bed and 10-gr. doses of aspirin, or salicylate of soda every four hours. If there be any tendency to constipation an aperient should be administered; boracic lozenges may be sucked; the diet should be liquid. As regards local applications, some find warm fomentations most comfortable, others get more satisfaction from a cold compress, consisting of lint soaked

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in cold water, and applied to the neck, covered with oil silk or protective.

CHRONIC PHARYNGITIS.

Chronic pharyngitis has many causes. It may be the remains of an acute pharyngitis, or it may be due to such diseases as anæmia, gout, rheumatism, dyspepsia, diabetes, excessive and improper use of the voice, and the irritation of tobacco smoke, alcohol, and other irritants. This condition of the pharynx is closely connected with that of the mouth, nose, and naso-pharynx, and the thick, more or less opaque, mucus in chronic pharyngitis may be really due to a post-nasal catarrh. The posterior pharyngeal wall, palate, and uvula are swollen and congested; the lateral bands lying behind the posterior pillars of the fauces are thickened; there may be granular patches on the pharyngeal wall. There is sometimes very little felt amiss, even in bad cases; in others the feelings of discomfort are very marked, and comprise aching, stiffness, irritation, and weakness. One point is noticeable, namely, that whilst swallowing liquids increases the discomfort, solid food often relieves it, differing in this respect from ordinary acute sore throat. Often, too, there is a feeling as of a foreign body in the throat which cannot be got rid of. Hawking and gagging efforts are more or less constantly being made with a view to clearing the throat, but only give partial relief. Sometimes the pharyngitis takes an atrophic or dry form, especially in diabetes, chronic Bright's disease, and alcoholics; the mucous membrane being thin, dry, and glazed, with but a slight amount of secretion on it.

The *treatment* of chronic pharyngitis depends largely on the etiology, and so it is necessary to correct, in the first place, as far as possible, injurious habits, such as excessive smoking and errors of diet; freeing the bowels with a blue pill at night, and a saline in the morning, is generally helpful. In some cases overwork is a marked factor, especially in teachers and the like, and in these cases very little

improvement can be obtained without rest, though if the method of voice production be faulty, lessons in this respect may be useful. The nose and post-nasal space must also always be examined to see whether an obstruction or discharge be present, which might have a bearing on the case. In all cases of pharyngitis sicca an examination of the urine should be made. All these things having been first considered, a coarse spray of bicarbonate of soda, etc. (see p. 249), to the pharynx, gives good results in many cases, and a pastille containing borax or eucalyptus and menthol, or carbolic acid, will generally relieve the irritation. Granular patches should be dabbed with a 10 per cent. solution of cocaine, and after an interval of five minutes burnt with a galvano-cautery, or in its absence a little trichlor-acetic acid on a probe, and afterwards sprayed with menthol in liquid paraffin, 10 grains to the ounce. The same treatment may be extended also to the thickened lateral bands. Just occasionally a tickling cough cannot be cured till the tip of the elongated uvula has been removed, especially is this indicated when it rests on the back of the tongue, and when other means of alleviating the irritation have failed. It should be painted with a little 20 per cent. solution of cocaine, and after five minutes' interval the tip should be seized with forceps, brought forwards and cut off with scissors obliquely, from before backwards, so that the raw surface lies behind. The surgeon must be careful to remove only the superfluous part, and never the whole uvula. In difficult cases it is customary to recommend the favoured few to take a course at some foreign spa, such as Aix-les-Bains, Carlsbad, Ems, Marienbad, or Kissingen; or to those unable to leave this country, Harrogate, Bath, Strathpeffer, or Llandriddod may be recommended.

ACUTE SEPTIC PHARYNGITIS.

Acute inflammation of the throat is produced by micro-organisms, of which the *Streptococcus pyogenes* is the

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commonest. The inflammation is characterised, pathologically, by the exudation of serum and pus, and in some cases it is so intense as to cause death of the tissue. The symptoms vary greatly in intensity, from the most superficial inflammation, which occurs as hospital sore throat, to the very fatal gangrenous form.

Septic inflammation especially attacks the debilitated and those who have been overworked and are run down, but, on the other hand, it may affect persons who appear to be in perfect health. The symptoms in the slight cases consist commonly of headache, sore throat, and general malaise. This form may pass off after a few days, or, on the contrary, develop into a severer type. It, however, may come on suddenly with rigors, pain in the throat, and rise of temperature. This latter, however, may be low, when the symptoms take the dangerous asthenic form in which death is likely to occur from cardiac failure.

There are also bad cases in which convulsions or delirium set in early, with irregular cardiac action and respiration, and the poisoning may be so acute as to produce death in a few hours. Sometimes the pharynx, sometimes the larynx, is the seat of attack—in the one case dysphagia, and in the other hoarseness, or aphonia, and difficult breathing being the leading features. Whichever it be, inflammatory cedema is the chief thing observable in the pharynx and larynx, and often particularly noticeable is the swelling of the uvula or epiglottis, whilst the tonsils may have the appearance of follicular tonsillitis. The disease runs a rapid course, and suppuration or resolution may occur, or it may spread occasionally upwards, much more commonly downwards; not uncommonly a firm inflammatory mass forms in the neck, which may suppurate or even slough, and pneumonia, pleurisy, meningitis, peritonitis, or pericarditis may occur. Though very fatal in its most severe forms, these cases must never be given up as hopeless, as remarkable recoveries sometimes take place.

Treatment.—The treatment of this affection must be strictly on tonic lines, endeavouring to preserve and support the vital powers of the patient, whilst this destructive wave passes over him. Light and frequently repeated supplies of nourishment, alcohol, ammonia, strychnine, perchloride of iron, and digitalis, may all prove useful if any signs of cardiac weakness show themselves, or quinine, if fever be marked. Naturally one turns to vaccines, but seeing the acute nature of the disease there may not be time enough for an autogenous vaccine to be prepared, so while this is in the making a ready-made streptococcal vaccine should be administered in full doses daily. Tension or suppuration in the tissues must be treated by incision. Sucking ice is often very grateful to the patient, but cold applications have a somewhat devitalising effect and must be used with caution. Antiseptic sprays, such as boric acid and borax, may be used, and are often grateful to the patient, but should not be persevered with if ineffectual and tiresome. Should laryngeal symptoms arise, they will require special treatment (*vide* p. 59).

RETROPHARYNGEAL ABSCESS.

Retropharyngeal abscess may be acute, though more commonly chronic, and is more common in children than in adults. The cases are divisible into two main groups: (1) Those connected with caries of the spine; (2) those unconnected with bone disease and affecting chiefly the submucous lymphoid tissue of this region, and generally due to microbes or trauma acting through the pharyngeal wall. In the former case rigidity or deformity of the spine will guide us to diagnose the underlying cause. In the latter the condition of the pharynx may help. The appearance which is present is that of a soft, doughy, semi-fluctuating swelling, generally rather to one side of the middle line on the posterior wall of the pharynx, more often below the soft palate than above it. There is, especially in young children,

a difficulty in swallowing, and the patient speaks, coughs, and cries as if there were a lump in his throat. If the inflammation has proceeded to the larynx he may be hoarse or even aphonic. If a good view cannot be obtained of a child's throat presenting these symptoms a digital examination must be made, as the condition is a dangerous one, rupture of the abscess with suffocation from pus entering the larynx sometimes occurring. These cases are most likely to be mistaken for croup, which the symptoms a good deal resemble; but the discovery of the bulging of the posterior pharyngeal wall makes the diagnosis.

Treatment.—In acute cases inhalation of steam may give some relief, but the pus must be evacuated by an incision made in the first group of cases, namely, those with bone disease, through the skin, generally behind the sterno-mastoid muscle; in the second group of cases, through the pharyngeal wall, the child being more or less inverted, so that the pus shall not run into the larynx.

YESICULAR ERUPTIONS IN THE THROAT.

Herpes.—Herpes occasionally affects the palate and pharyngeal wall, occurring generally as a small group of little round vesicles on a rather inflamed base. These quickly become opaque, and rupture, leaving small ulcers, which, coalescing, have been mistaken for diphtheria. Constitutional disturbance is, however, usually very slight, though mild febrile symptoms may occur. There is often a good deal of pain, sometimes preceding the appearance of the vesicles, a fact which is very significant of herpes. Gouty subjects are particularly liable to this affection. The spots may come out in successive crops, so prolonging the case.

Treatment.—The use of a simple mouth-wash of permanganate of potash or boric acid, and soft food for a short time, is all that is necessary.

Pemphigus is a rare but, owing to its very serious

nature, an important affection. It is a chronic malady and occurs as large bullæ on the palate and pharyngeal wall. These may be preceded or accompanied by a similar eruption on the skin; the blebs soon rupture and collapse, leaving an excoriated surface with more or less white deposit on it.

Treatment.—This should be directed to improving the general health. If there is much pain on swallowing, this may be alleviated by blowing orthoform and resorcin or anæsthesin over the sores, or painting with cocaine, 5 per cent. solution. A simple cleansing antiseptic mouth-wash may be used.

Arsenic has a great reputation in this disease, but most of the patients die.

SIMPLE FAUCIAL ULCERATION.

So-called simple faucial ulceration may occur, generally on the anterior pillar of one side only, but sometimes it is bilateral. The typical lesion is a clear-cut oval ulcer, with grey base, but no true membrane is present. It may or may not be painful. The bacteriology of the ulcer is not fully worked out at present, in fact, they are thought by some to be of rheumatic origin. These ulcers must be diagnosed from secondary syphilis on the one side and diphtheria on the other, but they do not closely resemble either.

Treatment.—The ulcer should be painted with tincture of iodine or a solution of nitrate of silver, 20 grains to the ounce, and a mouth-wash (p. 245) used. It soon heals.

Vincent's Angina is the name given to a form of ulceration of the soft palate and tonsils (usually unilateral), covered with false membrane, whitish, yellow, or grey in colour, or a layer of dead tissue having that appearance. On taking a smear by means of a swab ~~was~~ rubbed into the ulcer and staining with a dye, such as Loeffler's methylene-blue, a

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fusiform bacillus, beaded and shaped after the style of the familiar tip-cat, may be seen; also a spirillum rather larger than that of syphilis. The apparent false membrane breaks down and cannot be pulled off like that of diphtheria. The lymphatics (submaxillary) are usually enlarged.

The malady runs its course in from a week to a fortnight, and though not generally a serious disease sometimes the ulceration is deep and healing tedious, and occasionally a fatal result ensues from broncho-pneumonia.

Treatment.—A mild antiseptic gargle (p. 245), or a spray of hydrogen peroxide, 6 vols., and an antiseptic paint such as Mandl's solution, nitrate of silver, 20 grains to the ounce, or chromic acid of the same strength.

Keratosis and Mycosis.—Considerable confusion has arisen with regard to these affections, owing to the fact that what has been described as mycosis is really due to a remarkable overgrowth of keratinised epithelium, with a dead white appearance, growing chiefly from the lymphoid follicles of the tonsils, but also from the uvula, soft palate, and pharyngeal wall. The disease is very chronic, the symptoms generally very mild or absent. There may be slight smarting or irritation, but the disease often owes its discovery more to accident than design. An important point is the absence of any inflammation in association with the white patches. The little masses are difficult to detach, and bleeding may be the result of so doing.

Treatment.—As the disease is very difficult to cure and seems very harmless, reassurance and a masterly policy of inactivity is often a wise course to adopt; but should the patient, as is sometimes the case, appear mentally worried by the disease, and anxious to have something done, the patches may be painted with tincture of iodine, or 7 per cent. solution of salicylic acid, or cauterised with the galvano-cautery, or, in the case of the tonsils, these may be removed with the guillotine. True mycosis is rare, but occasionally occurs, and

consists of white patches on an inflamed base, and these may be shown by microscopical examination to consist of lepto-thrix. This affection, unlike keratosis, is easily curable with gargles, such as borax and chlorate of potash, or painting with solution of perchloride of mercury 1 in 1000.

Thrush.—A disease due to the fungus *Oidium albicans*, occurring commonly in poorly nourished children, and in the final stages of wasting diseases, such as phthisis in adults. White patches appear on the tongue, inner surface of the cheeks, soft palate, uvula, pharynx, and tonsils. They are associated with feelings of soreness, and the mucous membrane looks sore underneath if they are removed, although the surrounding part may not be inflamed.

Treatment.—Borax and honey or boroglyceride are generally effectual remedies. The general condition must, of course, also be attended to.

Diphtheria.—The throat specialist must be prepared to diagnose diphtheria, which in typical cases is distinguished by patches of membrane of a white, grey, or brownish tint, difficult to remove. A persistent attempt to do this generally causes bleeding. The membrane not uncommonly affects the tonsils, but is not usually limited to them. On the other hand, what appears at first sight to be an ordinary tonsilitis, or sore throat, may, on bacteriological examination, be found to contain the Klebs-Loeffler bacillus, and so must be diagnosed as diphtheria. Fortunately an immediate examination can be made by Neisser's method, confirmable by culture after a few hours, so that in all doubtful or suspicious cases this should be done, the patient in the meantime being isolated.

Syphilis.—Occasionally a primary sore is to be seen in the mouth, the lips or tonsils being a favourite position, and it is just as well to remember this when a patient without a temperature presents himself for examination, and we find an odd-looking ulcer with raised edge, and which may or

may not be indurated, but which is associated with bullet-like glands in the submaxillary region, and at the angle of the jaw, for it is just possible that a scraping of this ulcer may show the *Spirochaete pallida*. These ulcers do not, as a rule, give rise to much pain, though some soreness on swallowing is common. Infinitely more common, however, are secondary manifestations. Generally the earliest sign is an erythema of the soft palate and tonsils. This is very soon followed by very superficial kidney-shaped ulcers with whitish borders, symmetrical, and most commonly affecting the tonsils. These are serpiginous and have been compared with snail tracks in appearance. Also semi-translucent-looking, whitish, somewhat raised patches, surrounded by congestion and known as mucous patches, may occur on any part of the mucous membrane. Occasionally cases are met with of an affection very similar in appearance to this, which, however, is not syphilitic. The lesions differ in the following respects from true syphilides:

1. Anti-syphilitic remedies have no effect whatever, but arsenic does produce improvement.
2. The disease runs a most chronic course and is of long duration.
3. It is accompanied by a good deal of burning pain, and after nearly disappearing relapses.

Tertiary manifestations take the form of a gummatous infiltration. As the deeply congested swelling breaks down it leaves a punched-out ulcer with wash-leather slough at the base and sharply cut edges. The palate, or pharyngeal wall, are favourite places for the appearance of guminata, and, breaking down, they are very apt to destroy the uvula, soft palate, and sometimes the hard. Sometimes syphilis of the pharynx takes a very malignant form, the ulceration spreading and rapidly destroying the back of the nose and throat. It is common to have gross syphilitic lesions without much pain, the patient seeking advice rather on

account of the food and drink coming through the nose, the offensive breath, and the alteration of the tone of voice. Sometimes the Eustachian tube is affected, with resulting deafness, and later on cicatricial contraction and adhesions may give much trouble, cutting off the post-nasal space from the pharynx and so interfering with the drainage of that space. The contracted space between the palate and the pharyngeal wall can be dilated up temporarily, and various methods have been tried to prevent recontraction, but there is a very great tendency to relapse after a time. Syphilitic lesions are generally very characteristic in appearance, though varying greatly in severity, and slight cases of secondary syphilis of the fauces are sometimes missed through a somewhat careless examination of persons supposed to be above reproach. In doubtful cases a scraping and Wassermann reaction come to our assistance, together with the general glandular enlargement, alopecia, and other signs of constitutional syphilis. With malignant disease the tertiary form is sometimes confounded, but the hard infiltration of the former is different, though it must also be remembered that syphilis is a common forerunner of malignant disease.

Treatment.—In early syphilis the first thing is to warn the patient as to the intensely contagious nature of the disease. Intravenous administration of Salvarsan—606, or neo-Salvarsan—associated with the Wassermann reaction as a regulator, has to some extent superseded the older methods of treatment by mercury and the iodides, and the rapid way in which throat lesions particularly clear up is very striking. The tendency now is to give repeated injections of Salvarsan at increasing intervals, but also to combine this with iodide of potassium and mercury. In destructive forms of syphilitic disease mercurial inunction often gives excellent results, and in the services and in hospital practice intra-muscular injection of mercurial cream is a method largely used. In ordinary

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cases the small but long-continued doses of grey powder answer very well, but as the cases get into the tertiary stage, iodide of potassium in increasing doses will be required.

Directly syphilis is diagnosed the condition of the patient's mouth must be carefully attended to; any defective teeth must be dealt with, and a mouth-wash of chlorate of potash and borax freely used. With obstinate lesions paint of chromic acid, 10 grains to the ounce, gives good results. Tobacco and alcohol must be avoided.

Tubercular Disease is very rare, as compared with syphilis, in the pharynx, and when it occurs is almost always secondary to phthisis. It generally presents itself in the form of one or more ulcers, shallow, with dirty base and thickened and undermined edge. Pinkish granulations may be present, but the surrounding mucous membrane is generally remarkably anæmic. The seat is commonly the pharyngeal wall or tongue. These sores may coalesce, forming an extended ulcerated surface. In the case of a solitary ulcer, without constitutional symptoms, it may not be always easy to make a diagnosis. When this is the case, a portion had better be removed and examined for tubercle, also the Von Pirquet's or the subcutaneous test applied. As these manifestations generally indicate an advanced stage of tubercular disease, the prognosis in most cases is very bad. The ulcers are apt to be very painful and to interfere with the taking of nourishment.

Treatment.—As palliative measures, orthoform and resorcin, or anæsthesin blown on to the lesion ten minutes before a meal, or spraying with 5 per cent. cocaine solution, by relieving the pain of deglutition enables the patient to take food fairly comfortably. If his general condition permits of it something more radical may be attempted, such as scraping the ulcer and applying 50 per cent. to 100 per cent. lactic acid afterwards, or the application of the galvano-cautery.

Lupus sometimes attacks the throat and may or may not be accompanied by manifestations of the same disease in other parts of the body. It commences generally in young people, and may attack the palate, gums, or fauces. It consists of a pink nodular infiltration, having but little tendency to actual ulceration. These nodules break down and cicatrise, the discharge being very slight; in fact, dryness is, comparatively speaking, a marked feature.

The disease is very chronic and almost painless, differing markedly in this latter respect from ordinary tubercular disease. Sometimes a patch will disappear either spontaneously or as the result of treatment, and shortly afterwards manifestations of the disease appear in some other part.

Treatment.—Arsenic in gradually increasing doses has a very marked effect in many cases of lupus. In addition to this, curetting, applications of lactic acid, and the galvanocautery have all been found useful, and so have the X-rays and Finsen's light treatment when they can be brought to bear on it. Both lupus and ordinary tubercular disease have been treated extensively with tuberculin, human and bovine, but, on the whole, the results have not been brilliant.

Leprosy, rhinoscleroma, and actinomycosis may all affect the throat, but are so rare that mere mention of them is sufficient.

AFFECTIONS OF THE FAUCIAL, POST-NASAL, AND LINGUAL TONSILS.

Acute inflammation of the faucial tonsils is associated most commonly with strepto- and staphylococci. It occurs most commonly in young adults, and appears to be more or less infectious. Exhaustion, cold, and damp predispose to it, and it is doubtless associated with rheumatism, often preceding rheumatic fever. The patient commonly feels ill, with aching of the limbs, and complains of sore throat. He

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feels chilly and may have a rigor. The temperature runs up quickly to from 103° to 105°, differing from diphtheria, where a slow onset and low temperature are common. The breath is foul and the tongue is furred, and there is often great difficulty in opening the mouth and in swallowing; in fact, any movement involving the throat is painful, the pain shooting up to the ears. The voice is markedly altered, and there is a more or less constant desire to get rid of saliva. The submaxillary glands are somewhat enlarged. Constipation and the other usual concomitants of fever are present. The affection may be unilateral or bilateral, often appearing on one side first, and then on the other. The swelling may be so great that the patient seems threatened with asphyxia, appearing almost to be about to choke; but though it may seem imminent, death from this cause is exceedingly rare, considering how common the disease is. Suppuration or resolution may take place after a few days. If the former, the abscess, most commonly a peritonsillar one, usually points in the soft palate just above and outside the tonsil, pushing the latter towards the middle line. Caution in these cases is necessary, because inflammation of the tonsils may be simply a part of a more deadly disease, such as diphtheria, scarlet fever, or acute septic pharyngitis, so that without discussing these diseases at length, to enable us to arrive at a correct diagnosis, investigation should be made with special attention to the following points:

1. A bacteriological examination.
2. Examination as to the presence of any rash.
3. Examination as to the urine.
4. Noting the character of the pulse.
5. Noting whether the inflammation is confined or not to the tonsils.

In follicular tonsilitis the inflammation is more superficial, and there is less swelling. The crypts are specially

involved, being filled with yellowish-white masses, which often coalesce and which are not so adhesive as membrane. In proportion as the tonsil appears to be itself not so much concerned, but to be pushed inwards towards the middle line, we consider the inflammation peritonsillar; but it is very difficult to say for certain that the deep portion of the tonsil itself is not affected, especially as the tonsillar fossa sends up diverticula to the soft palate where peritonsillar abscess points.

Treatment.—The patient should go to bed and take 10 grains of aspirin or sodium salicylate, with 10 minims of aromatic spirits of ammonia every four hours. If the disease appears more likely to be of septic, rather than rheumatic origin, quinine, in 5-grain doses, every four hours, is better. The bowels should be well opened; for this purpose, in most cases a dose of calomel, followed by a saline aperient, is the best. In bad cases gargling disturbs the patient too much, and it is much better to spray the throat with glycerine and borax, and carbolic acid pastilles



FIG. 29.—PERITONSILLAR ABSCESS.

may be sucked. Ice is generally grateful to the patient, and externally hot fomentations, or antiphlogistine, may be applied. The nourishment must be liquid and plentiful, consisting chiefly of milk, beef-tea, and the like. When taking it, steady pressure just in front of the articulation of the lower jaw, with the fingers, enables the patient to swallow, with much less discomfort. As the case proceeds, the surgeon must be on the look out for suppuration, and if, on this point, the visual manifestations are not clear, a very gentle digital examination should be made. The point where the

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abscess can best be reached is generally through the soft palate, above the tonsil and just about on a level vertically with the top of the arch of the soft palate. Hilton's method, by means of a scalpel, followed by dilating forceps, should be used. If an ordinary bistoury is made use of it is well to protect three-quarters of the blade with a strip of plaster or gauze, to avoid any unintentional damage to other parts. The pus may be very deeply situated, and few indeed are the surgeons who are fortunate enough to strike it invariably at the first attempt, but the incision, at any rate, helps to relieve tension. During this little operation the patient's head should be well supported, and if it be a child he should be gagged and securely held, for in these cases a general anæsthetic is often undesirable, and local anæsthetics, such as cocaine, but of little use. Removal of the tonsils during the febrile stage should be reserved for cases of extreme obstruction. A sharp attack of tonsilitis leaves the patient very weak, and a week or two at the seaside, with tonics and special nourishment, is generally indicated. Should paralytic symptoms supervene affecting the eye, palate, etc., the practitioner may conclude that his patient has been suffering from diphtheria. Vaccines, strepto- and staphylococcal, have been used apparently with great advantage in some cases. There can be no doubt but that the post-nasal tonsil, or adenoid growth, is also subject to similar diseases, and that it may be attacked at the same time, or separately, from the faucial tonsil; and this should be suspected if there be marked deafness and nasal tone of the voice, or muco-pus coming down from behind the palate, and pain in this region. Medicinal treatment should be the same as in faucial tonsilitis. A warm, coarse, alkaline spray, or one containing boric acid, may be used through the nose, but the nasal douche must be strictly avoided. More rarely the lingual tonsil is affected in the same way as the faucial, and should be treated on similar lines. The chief danger

here lies in extension of inflammation to the larynx, and early incision may be required.

CHRONIC ENLARGEMENT OF THE FAUCIAL TONSILS, AND ADENOIDS.

Since these are so commonly associated it would be better to consider them together. In what appears to be the normal condition of affairs, the tonsils, a few years after birth, cease to grow. As childhood passes to adolescence they begin to atrophy, becoming hard, shrivelled, and fibrous. In many cases, however, this is not the case, an enlargement taking place, generally more or less associated with chronic inflammatory changes. In some cases the crypts are affected, becoming filled with white cheesy little masses, consisting chiefly of fatty and granular matter and micro-organisms. These are apt to become detached, the patient finding small, evil-smelling, and tasting bodies loose in his mouth. When the orifice of the crypt becomes blocked the material accumulates and a small cyst may form, the white colour of which is seen gleaming through the thin tissue over it. A very rough rule has been formulated, which says that faucial tonsils which project beyond the pillars of the fauces are enlarged, and pharyngeal tonsils, which more or less cut off the view of the septum nasi in the mirror in posterior rhinoscopy (see p. 102), are also enlarged; but the converse is by no means correct, for a buried tonsil may be enlarged, and in some cases considerable quantities of adenoids may be present, although the septum can be seen from top to bottom. The symptoms caused by enlarged tonsils include difficulty in swallowing and breathing, and sometimes a tendency for fluid to pass upwards and backwards and through the nose, also vomiting and digestive disturbances. When the tonsils are very large, earache and deafness may be produced, and chronic cough is not uncommon. In obviously diseased tonsils the discharge into the mouth of decomposing secre-

tion can hardly do otherwise than injuriously affect the health, and again the danger of a fever, such as diphtheria, affecting the throat is decidedly greater in the case of a subject with greatly enlarged tonsils. The pharyngeal tonsil is a structure normally present at birth, and like the faucial tonsil it grows for a few years after, and then atrophies with

the approach of adult life, though as a curiosity it may be present even in old age.

When the pharyngeal tonsil is enlarged, or fails to atrophy, the patient is said to have adenoids. Very often enlargement occurs, or the growths first become noticeable during or after an attack of one of the fevers so common in childhood, such as measles. The symptoms which may be produced are chiefly those of nasal obstruction. From this cause a baby may be unable to suck properly, often sleeps badly, snores, and is the subject of nightmare. As age ad-



FIG. 30.—A BOY WITH WELL-MARKED ADENOIDS.

vances the proper development of the jaws is interfered with. The nose is narrow, the bridge sunken, with enlarged veins crossing over it; the mouth open; the upper lip short and sore, owing to irritating discharge from the nose running down, due to the presence of chronic rhinitis. The mucous membrane of the mouth is apt to get dry. The expression is one of stupidity, and as the patient is often a little deaf this makes him appear still less intelligent. Want of concentration is noticeable; some loss of taste

and smell is often observable; earache, with persistent or recurrent attacks of suppuration of the middle ear, are common, and so is chronic otitis media without suppuration. The voice becomes dead, such words as "mutton" and "bone" losing their resonance entirely.

Owing to the mouth having to be kept open for breathing purposes there is extra pressure on the teeth from the cheeks externally, and lack of support internally, so that the vault of the palate becomes high and arched, which tends again to reduce the calibre of the air passage through the nose.

This upward extension of the vault is believed by some to be one of the causes of deviated septum. The teeth are apt to be decayed and irregular, and the chest badly developed, grooved where the diaphragm is attached to the ribs and the sternum prominent.

Occasionally, however, the above signs and symptoms may be found without the presence of adenoids, and on the contrary much growth may be present with but little external indication, so nothing is conclusive short of a view by posterior rhinoscopy, when the growth may, in favourable cases, be seen hanging down from the vault of the nasopharynx, cutting off the view, more or less, of the posterior border of the septum. Aberrant patches of adenoid tissue may also be sometimes seen lower down along the posterior pharyngeal wall and in the fossa of Rosenmüller behind the Eustachian tube on either side; or a digital examination, revealing something which has been likened by the imaginative to a bundle of worms, makes one feel certain that adenoids are present.

CHRONIC ENLARGEMENT OF THE LINGUAL TONSIL.

The symptoms produced by this condition are much more indefinite than those caused by enlargement of the pharyngeal and faucial tonsils; indeed, in making a routine examination with the laryngoscopic mirror it is very common to see

marked enlargement of this structure, with apparently no symptoms at all. Sometimes, however, especially in neurotic adults, a sense of fulness or a lump in the throat, with tickling, coughing, and hemming, is complained of, or the voice may get quickly hoarse, or the speaker or singer get rapidly tired. Sometimes neuralgic pains or aching or a feeling of weakness, and occasionally dyspnoea or dysphagia, are troublesome symptoms.

On examination with the mirror we find enlargement of this tonsil, more or less completely filling up the space between the base of the tongue and epiglottis, with very commonly enlarged veins crossing over it. These, however, appear to have no particular significance.

Treatment. — Operative treatment is not required in every case of enlarged tonsils and adenoids, but is necessary when they are so large as to interfere with hearing, respiration, deglutition, or phonation, or appear to be a distinct cause of irritation, keeping up troublesome cough, or when there are repeated attacks of tonsillitis, or when the glands are enlarged and tubercle is suspected, or when obviously diseased. Any septic condition, such as decayed teeth, should first be corrected, and in slight cases if this be done and the child be sent to the seaside for a month, and have breathing exercises, the necessity for operation may not arise; but if the obstruction be great these exercises will only do harm, and should be postponed till after operation. If operation is refused, something can be done as regards the tonsils by painting with tincture of iodine, clearing out the crypts, and cauterising with the galvano-cautery. If the patient is an adult, and the tonsils tough and fibrous, and especially if a general anæsthetic is objected to, they may be gradually removed by means of punch forceps under local anæsthesia; but, as a general rule, operation in the form of tonsilotomy, with a sharp guillotine, or tonsilectomy, i.e. enucleation of the tonsil, together with its capsule, will be the method best

suited for dealing with the case. Although enucleation has come very much to the fore recently, there are still many who think that for tonsils which appear to be doing harm only by their size and projection into the air-way, tonsilotomy, or the operation of taking off the greater part of the tonsil, is sufficient, and when performed by an expert this operation takes only a few seconds, and recurrence is rare; but for such as cannot be easily engaged in the guillotine, or where there are enlarged glands in the neck, or there have been several attacks of tonsilitis, or there is chronic follicular tonsilitis, some method of enucleation should be adopted. Taking one case with another, there can be no doubt but that tonsilectomy must be looked upon as a more serious operation than tonsilotomy, and the anæsthesia must be more profound, requiring a highly skilled anæsthetist, the pillars of the fauces are more liable to be damaged, and the convalescent period is longer and more painful; nevertheless, this operation seems to be steadily superseding its older rival tonsilotomy.

The Anæsthetic.—No anæsthetic is absolutely required for the removal of either tonsils or adenoids, or both, and operators may be found even in this country who perform this operation without an anæsthetic; but the majority of surgeons are in favour of general anæsthesia, especially when tonsils and adenoids both have to be dealt with. For an expert, nitrous oxide gas or ethyl chloride give ample time for tonsilotomy and the removal of adenoids. If, however, the case presents special features, such as the presence of hypertrophic rhinitis, requiring treatment at the same time, or enucleation of the tonsils is proposed, chloroform or ether, or both, in the form of C.E. mixture, had better be selected. The disadvantage of ether is, that it produces more mucus and hæmorrhage, both troublesome features in these cases; but it is, generally speaking, safer, though I believe that chloroform, slowly given by a good anæsthetist, is attended with practically no danger. A noteworthy point

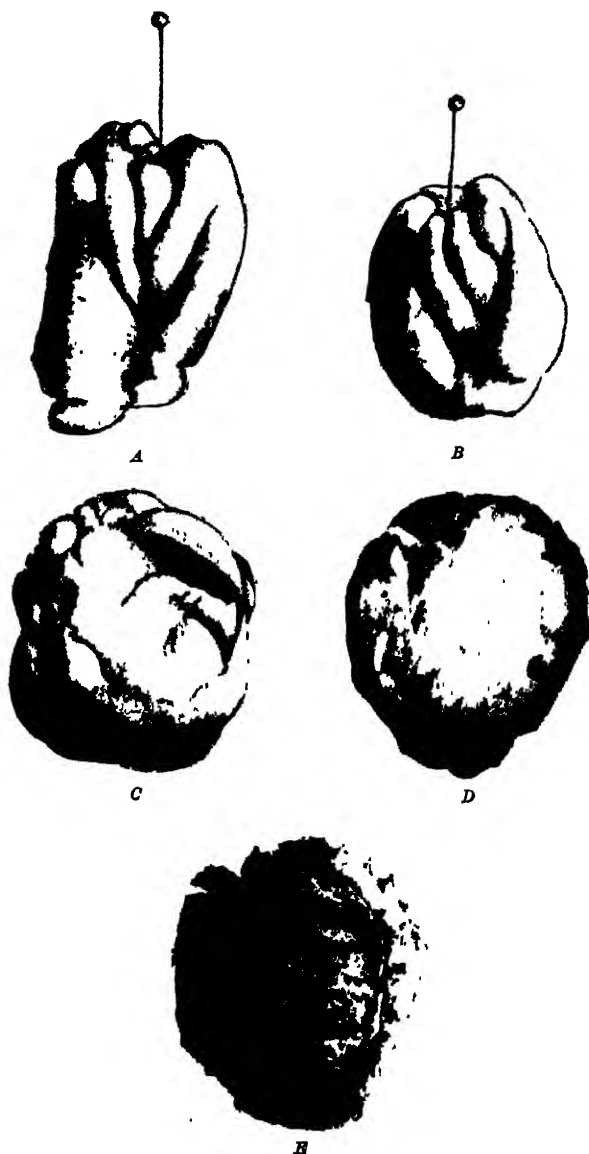


FIG. 31.—ADENOIDS AND TONSILS.

A, B, Adenoids; C, inner; D, outer surface of tonsil removed by tonsillectomy; E, tonsil partially removed by tonsillectomy, showing cut surface.

is that when the operation is about to commence, both when the mouth is being opened with the gag and also after the operator introduces his finger into the post-nasal space, breathing is apt to stop temporarily, and the gag should be relaxed, or finger removed. It is just possible that the curious disease known as status lymphaticus, which is characterised by enlargement of the lymphatic glands, thymus and spleen, is occasionally blamed for mortality really due to unskilful administration of chloroform; but, on the other hand, the reverse may occur. It is a usual thing nowadays to precede the ether or chloroform by a subcutaneous injection of atropine or scopolamine and morphia.

Position.—With short anæsthesia tonsils and adenoids may be removed with the subject in the sitting position in the dental chair, due precaution being taken to ensure that he does not slip down; but, as a general rule, the lying down posture is best, some surgeons preferring that the head should hang over the end of the table, so that the blood does not run down the throat; some with the head slightly raised, with the chin in the middle line; others with the face turned to one side; some, again, like the patient quite flat, with the occiput resting on the table. The great point seems to be to choose one position and keep to it, so that one gets to know automatically, as it were, exactly where one's landmarks are. When the position selected is not one with the head hanging down, care is necessary to keep the throat free from blood, and for this purpose the somewhat suspected and despised marine sponge is by far the best, when skilfully used, both for removing blood and checking hæmorrhage without damaging the tissues. Turning the patient's head over to the side and raising the opposite shoulder so that the blood may run out of the mouth if the hæmorrhage is at all free is a good plan. As regards the order of removal in tonsil and adenoid operations there is a difference of opinion as to whether the tonsils or adenoids should be removed first; but,

in my opinion, if tonsilotomy and not tonsilectomy be the operation it is better to remove the adenoids first, especially if short anæsthesia, such as is obtained from nitrous oxide gas, be employed, because the necessary manipulations for the removal of adenoids are best performed whilst the anæsthesia is most profound, and because the bleeding from the tonsillar area, which is apt to be more profuse than that from the site of the adenoids, is best coped with by the patient when the operation is at an end and he is beginning to come round.

In cases of short anæsthesia the gag must be introduced before the anæsthetic is administered, and it must be so placed as regards the teeth that a secure hold is obtained. If it be not so introduced the operation will not improbably be wrecked, more or less, for there may be very great difficulty and delay in introducing it when the patient is under the influence, so that there may be insufficient time remaining to properly do what is necessary. The best form of gag is one such as Doyen's, which will lie flat against the cheek under the facepiece of the mask. An expert operator can generally remove both tonsils with the guillotine without having to alter the position of the gag.

Various methods have been employed to assist in getting the tonsil through the ring of the guillotine, one being pulling the tonsil through with forceps, another method is to hook the ring over the tonsil and draw it forward, pressing it against the alveolar eminence of the inferior maxilla, and so forcing it further through the ring. Yet another way is to turn the dorsal surface of the guillotine towards the tonsil, and having hooked the ring over its lower pole carry the handle of the instrument across to the opposite angle of the mouth, so the blade is now nearly transverse; now draw it forward, bringing the tonsil with it, and press the latter through the ring by pressing on the anterior pillar of the fauces with the forefinger of the left hand, supposing it be the right tonsil which is to be removed.

If in this manœuvre a blunted tonsilotome be used, the blade, if the instrument be properly handled, will work its way between the capsule and the pharyngeal wall and enucleate the tonsil; but considerable force will have to be used, as the operation is a crushing, not a cutting, one. Numerous modifications of Mackenzie's instrument have been introduced, in fact, the budding specialist seems to have an uncontrollable impulse in this direction though one cannot help thinking that often it is the operator, rather than the tool, which requires perfecting. Personally, however, I prefer an *écraseur* for enucleation. In this method the mucous membrane is divided longitudinally, just in front of the anterior pillar, with scissors curved on the flat; the white, glistening capsule of the tonsil is now exposed, and scissors may now be used to free the latter above and behind; this having been done, the *écraseur* wire is slipped over the tonsil, steadied by tenaculum forceps, and the removal completed.

One of the chief difficulties in this operation is the tendency for the tongue to get in the way of the operator; this must be prevented by means of tongue forceps, spatula, or tongue clip. Sharp, cutting instruments should be used as little as possible for enucleating, in order to minimise hæmorrhage.

OPERATION.—It may be well to shortly describe an operation in its simplest form.

The removal of adenoids and tonsils (tonsilotomy) under nitrous oxide gas or ethyl chloride.—The patient having been kept without food, except a cup of tea, milk, or bovril, for from six to twelve hours previous to operation, is placed flat on his back on a suitable table. The gag having been introduced and the anæsthetic having been given, the mouth is widely opened, the surgeon standing on the right and facing the patient. The anæsthetist sees to the gag, steadies the head, and, in the absence of other assistance, sponges out the parts. The patient being securely gagged, the surgeon introduces

the forefinger of his left hand and rapidly slips it behind the uvula and soft palate into the post-nasal space, noting the position and extent of the growths and the presence of any abnormality, such as undue prominence of the upper cervical vertebræ. The instrument used for their removal is most



FIG. 32.—REMOVAL OF ADENOIDS WITH THE CAGED CURETTE.—After ST. CLAIR THOMPSON.

commonly a curette, and if this be provided with a cage, the portion removed is firmly held by the instrument. The blade is passed up in the middle line behind the soft palate till it meets the upper part of the posterior border of the septum nasi, when, with a sweeping movement, downwards and backwards, the central mass of the adenoids is removed, and will be found in the cage. The finger-tip is again introduced, and if any more growth be detected this is removed with another

curette. Unless the hæmorrhage be free and embarrassing, the surgeon may at once proceed to remove the tonsils, pressure being made behind the angles of the jaw by the anæsthetist. The ring of a guillotine of the Mackenzie pattern, or one of its modifications, is slipped over one of the tonsils, beginning at the lower pole, and then pressed firmly outward, so as to engage it well in the ring. The blade is then driven home and the tonsil cut through, but generally adheres to the inner surface of the instrument, *i.e.*, that towards the middle line. A scooping movement of the tonsilotome helps to bring the tonsil safely out of the mouth, and tends to check any inclination for it to fall down into the pharynx or larynx. The other tonsil is then treated in the same way, and the patient turned quickly over on to his side and the blood sponged out. It is a good plan now to sponge the face with cold water, as it checks the hæmorrhage reflexly and brings the patient round. Before the patient leaves the table the throat should always be examined to make sure that no tags have been left; if any such be visible, they should be at once removed with forceps or blunt-pointed scissors curved on the flat. For the removal of adenoids some surgeons prefer forceps to the curette, but they are rather more difficult to use. The tip of the forefinger of the left hand guides the blade of the forceps to the growth, and then, having opened the blades widely and seized the growth, by pressing the tip of the left forefinger just below the mass, one checks any tendency to stripping down of the mucous membrane.

Without wishing to seem discouraging, a word of caution is here very necessary, for although removal of adenoids and tonsils is such a common operation, that it is often looked upon as quite a trivial matter, this is not altogether a correct view of the case. Experience shows that practitioners who adopt this attitude are only courting disaster. A large number of deaths have occurred during the operation, and the following untoward results have come at various times

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under my own notice as the work of operators with more assurance than ability :

From the unskilful use of the curette and forceps.—Very severe pain and stiff neck, troublesome hæmorrhage and suppuration, stripping down of the pharyngeal wall, damage to the uvula and soft palate, injury to the Eustachian tube, damage to the septum nasi, and very commonly the greater part of the growth not removed.

From the use of the guillotine.—Laceration of the tongue, uvula, and pillars of the fauces. Also anterior portion and lower pole of tonsil often left behind.

Adenoids in older patients and in those who have already been operated on before are tougher and more difficult to remove completely than in young and virgin cases. Parents and friends are always anxious to know, after tonsilotomy and adenoid operations, whether recurrence is likely to occur, or the voice injuriously affected. If the operation has been thoroughly performed, and the patient is above the age of puberty, recurrence is decidedly rare, but with younger children a more guarded prognosis must be given, and the answer should be, as regards them, "By no means probable, but just possible." The voice, in all probability, will be decidedly improved.

After-treatment.—The patient should be put to bed, and for the first few hours it is better that he should have nothing but sips of cold water. After that, vomiting being absent, liquid nourishment may be taken, preferably cold or lukewarm. The temperature being normal on the third day, he may get up and have soft food, and should now use a mouthwash of boric acid or weak permanganate of potash, but by no means syringe the nose. An aperient should be administered if necessary; he had better remain in the house till the end of a week, gradually resuming his ordinary diet as pain on swallowing disappears. A little pain and stiffness at the back of the neck is a common sequela, and so

is earache, which will generally gradually subside under the use of hot fomentations, but which may pass on to acute suppurative otitis, with complications, which must be treated on the lines indicated on page 205. Suppuration of the middle ear may occur after the use of either the curette or forceps; it is rare with the expert, but common with the inexperienced operator. A short period at the seaside may be necessary to restore full vigour, and breathing exercises should be taken, and the evil habit, which has so often been acquired, of mouth-breathing, being now no longer necessary, must be broken.

As a rule, after removal of the tonsils and adenoids, hæmorrhage ceases in a few minutes, but with advancing age trouble from bleeding becomes more probable. If there is primary or secondary hæmorrhage coming from the seat of the adenoid operation, which is very rare, the post-nasal space should be sprayed with ice-cold solution of hazeline. If it continues it is better to give an anæsthetic and make sure that no tag is present, and if necessary introduce into the post-nasal space a small sponge with tape attached, using the fingers or adenoid forceps for the purpose. The tape must be secured outside the mouth, and the sponge must be left in under twelve hours. The tonsils more often give trouble in this way, especially in older patients, where they are tough and fibrous, or in cases where abnormal blood vessels are present, or the patient is a bleeder; the immediate cause of secondary hæmorrhage being usually the eating of solid food, violent exertion, or shouting too soon after the operation. After examination, in slight cases order perfect rest. Sucking ice, or sponging with solution of gallic acid, hazeline, peroxide of hydrogen should be tried, or adrenalin 1 in 1000 applied on a pad of lint. A mixture of solid gallic and tannic acids applied with the finger has been recommended. If the patient is restless a small dose of morphia may be given with advantage. If these measures fail, or the hæmorrhage is sharp, an attempt should be made to seize the vessel with artery

forceps, or, if this is impossible, try cauterisation with a dull red galvano-cautery point. If bleeding still continues it may be necessary to stitch or clamp the anterior and posterior pillars of the fauces together, so compressing the bleeding parts—not, however, a very easy proceeding to do effectively. Cases have been recorded in which the carotid arteries, external or common, had to be tied as a last resource. It is, however, extremely unlikely that the normally placed internal carotid itself will be damaged in any of the above operations.

In cases of spontaneous hæmorrhage from the mouth, excluding the lungs, larynx, and stomach, the source is generally the back of the nose or from spongy gums, unless some serious disease be present, such as malignant ulceration.

Tonsiloliths, or calcareous concretions in the tonsil, sometimes occur, in most cases the tonsillar fossa being the seat. The diagnosis is made with the probe or finger. The best treatment is generally removal of the tonsil altogether.

DISEASES OF THE UVULA.

The uvula is occasionally absent from developmental causes, but far more commonly as the result of disease, especially syphilis, or too drastic or unskilful surgery. It is often bifid, from arrested development, and often hypertrophied, which may require occasionally partial removal (see p. 17). The pillars of the fauces, particularly the anterior, are sometimes perforated, and the etiology of this has led to much discussion. In some cases, no doubt, the condition is developmental, and in others due to



* Pl. 33.—BIFID UVULA WITH PAPILLOMA.

some destructive disease, such as scarlet fever, when the history, presence of cicatrices, adhesions, and want of symmetry will help to the correct diagnosis.

TUMOURS OF THE PHARYNX.

Simple tumours of the pharynx are fairly common, particularly papillomata on the pillars, soft palate, and uvula; but fibromata, lipomata, adenomata, mucous and dermoid cysts, and cysts connected with the thyro-lingual duct in the region of the foramen cæcum at the base of the tongue, also aberrant thyroid tumours, may be found in the same area. They may, if doing harm to the patient physically or mentally, be removed. As regards the aberrant thyroids, if the thyroid gland appears to be absent in the neck it is a better practice to be cautious and not to remove the whole of the tumours.

MALIGNANT DISEASE.

Malignant disease occurs in the shape of epithelioma, endothelioma, and sarcoma, and may attack any part, the pillars, soft palate, and tonsils being favourite seats for carcinoma, which generally presents itself to our notice as an induration, breaking down and ulcerating with more or less infiltration of the surrounding parts. The glands of the neck are soon involved. It is rare below middle age, while sarcoma is common in young adults. All ordinary kinds of sarcoma occur, but lympho-sarcoma is the most common, and occurs usually in the tonsil; in fact, what appears to be a large, rapidly growing tonsil may turn out to be a sarcoma. These tumours differ in consistency from the carcinomata, feeling not so hard but more elastic. As the case proceeds, the glands of the neck become affected, and a large, firm mass is apt to form at the angle of the jaw, with ulceration on the internal surface of the tumour.

Symptoms of carcinoma are in the early stages slight,

but as it advances we get pain, salivation, with foul breath, difficulty in moving the parts, so that deglutition and speech are interfered with, whilst with sarcoma pain is very much less common, so that patients often do not really believe in the serious nature of their malady.

To make the *diagnosis* of carcinoma definitely it will often be necessary to remove a portion of the tissue, as syphilis, tubercle, or septic ulceration, besides other rarer forms of disease, may simulate it. When syphilis is at all probable, a Wassermann test should be done, and, if positive, Salvarsan administered; but where practically no doubt exists, valuable time must not be lost if the case is operable; but if not, diathermy, radium, or X-rays should be given a chance. As regards sarcoma, the diagnosis from syphilis, tubercle, or septic conditions may have to be made, when the Wassermann reaction, condition of the lungs, recent febrile attacks will have weight; but here again it may be necessary to remove a portion of the growth for microscopical examination.

As regards operation, although some of the sarcomata appear to be definitely encapsuled, what appears to have been complete removal has been followed in some cases by rapid and fatal recurrence. However, others have done well, and removal, if at all practicable, should always be recommended; if not, radium, which has given remarkable results in some cases, should be tried. Coley's fluid occasionally seems to relieve apparently hopeless cases. Diathermy has lately given good results.

FOREIGN BODIES IN THE PHARYNX.

These are found in great variety, from a herring-bone to a mutton-chop in a gluttonous individual. Bones, especially fish-bones, are the most common, although articles, such as pins held in the mouth or between the teeth or lips, and then accidentally swallowed, are by no means rare. The patient's power of localisation is so vague as regards the pharynx that

it is apt to mislead, and so may be disregarded, and the scratch made by the foreign body is very frequently mistaken by the patient for the foreign body itself. If nothing can be seen after careful examination with a mirror, the parts should be gone over with a probe, as this valuable method often indicates the position of small fish-bones which might otherwise be missed in a tonsil, this being a very favourite place for them to stick. For removal, suitable forceps will be necessary. If nothing can be found by these methods the finger should be tried, and if the foreign body consists of metal, an X-ray photograph taken. In some cases it will be necessary to use Bruning's tubes, and the direct method under cocaine or general anæsthesia. In the case of a large foreign body blocking up the throat and interfering with breathing, if immediate removal cannot be effected tracheotomy may be necessary.

PHARYNGEAL NEUROSES.

Sensory.—These occur as hyperæsthesia, paræsthesia, or anæsthesia, either more or less *permanent*, as the result of organic disease, as in bulbar paralysis, or *transitory*, as the sequelæ of a fever, such as diphtheria or influenza, or due to hysteria, gout, or rheumatism. Speaking of this latter class, under paræsthesia are included all sorts of pains, aches, lumpy feelings, and weakness, which really distress the patient very much, but for which there is but very little to be seen. The patients are very commonly gouty or rheumatic, and sometimes the trouble appears associated with the menopause. The ultimate prognosis is good. Granulations may be found in the posterior wall of the pharynx, and the lingual tonsil is often enlarged; a cauterisation of these will often give temporary relief, but the method should only be employed in strict moderation, and after a careful detailed examination of the pharynx, including the tonsils and post-nasal space, has failed to reveal anything

in the way of serious disease, and the patients having been reassured as regards the absence of malignant disease, which they often suspect, and advised as to their general health and habits. In some cases galvanism or cold douching externally is useful. The prognosis in these cases is good, and they ultimately get well, but they are apt to run a protracted course, and relapses are common. Where the anæsthesia follows fevers, such as diphtheria or influenza, general tonics, such as strychnine, arsenic, and iron, are useful.

MOTOR NEUROSES.

These take the form of rhythmic movements of the palate, pharyngeal wall, or tongue, sometimes producing audible sounds. Tonic spasms may occur. These phenomena may be hysterical, or due to organic disease. Paralysis of the palate may be of central origin, as in bulbar paralysis, or due to peripheral neuritis, as in diphtheria, or may be myopathic, or a pseudo-paralysis may be present owing to the mechanical effect of infiltration. Researches into the nerve supply of the palate seem to indicate that whilst the constrictors of the pharynx and levator palati are supplied by the spinal accessory, the tensor palati is supplied by the fifth nerve. The appearances produced by paralysis of the palate are, if bilateral, the soft palate hanging loosely down in the middle line, and not responding to stimuli, the voice in speech being altered, and, on attempting deglutition, nourishment is apt to pass into the nose. In unilateral paralysis the uvula is drawn over to the healthy side, and the arch of the palate is lower on the paralysed side; but too much reliance must not be placed on this, as inequality of the arch is common without paralysis. A more certain indication is the dimple, which normally forms in the middle line above the uvula when the patient says "Ah," and which appears not in the middle line, but at the sound side when there is unilateral paralysis.

Treatment.—In these affections faradisation and the injection of strychnine are our sheet-anchors.

THE LARYNX.

Seeing that for the examination of the base of the tongue and adjacent parts a laryngeal mirror will be necessary, it will be well here to describe the method of using this instrument. Four at least had better be obtained, of varying size, two large and two small, the smallest sizes being necessary for infants and posterior rhinoscopy. They should be circular in shape, fixed to a metal handle at about an angle of 120°. The largest mirror should always be used which the patient can take. The surgeon having taken his seat in front of the person to be examined, and arranging his light and head mirror so as to be able to readily focus the rays on the patient's mouth, selects his mirror, notes that its surface is clean, and holds it over a flame—preferably the smokeless one of a spirit-lamp, with the glass surface towards the flame to prevent the breath condensing on it and so rendering it useless as a reflector. He will then see a thin sheet of moisture first appear and then disappear; he now tests the heat by touching the back of his hand with the back of the mirror until he gets just the temperature which can be comfortably borne. **This test must never be omitted, as it is better for the doctor to burn himself than his patient,** for the latter generally watches the little manœuvre with great interest, and at once loses confidence if the mirror is too hot when placed in his mouth. A great heat also is very damaging to the mirror, rapidly spoiling the bright reflecting surface and rendering it well-nigh useless. In cases where a flame is not available, other methods of preventing the obscuring of the mirror must be used, *eg.* hot water, or a 5 per cent. solution of lysoform, or rubbing on soap, or by means of special pencils sold by the instrument-makers.

The mirror having been thus prepared, the patient is asked to protrude his tongue, open his mouth and breathe steadily in and out. Across the upper surface of the tongue the surgeon lays a tongue-cloth or clean towel, folding it under the lower surface, and gently but firmly grasps the protruded organ between the forefinger and thumb of his left hand. Should the patient, however, have a moustache or



FIG. 34.—EXAMINATION OF LARYNX.

long upper lip, these are held out of the way by the forefinger, and the second finger takes its place in holding the tongue. In some persons the lower incisor teeth are so sharp as to render this manœuvre painful; when this is the case they must be covered with a small pad of cotton-wool. The mirror, then held in the right hand like a pen, is passed back to the uvula, being careful not to soil the bright reflecting surface in its passage, and it is turned so that the glass is directed forwards and downwards, the back resting against the base of the uvula and the lower margin, close to but not

touching the pharyngeal wall. The mirror should be placed steadily in position and moved as little as possible, as tickling rather than touching is resented by the parts, and produces retching. In difficult cases a little 3 per cent. cocaine may be sprayed on the uvula. The image which now appears in the mirror is inverted vertically, but not laterally, that is to say, that what appears to be anterior in the mirror is really posterior, and *vice versa*, but what appears to be right and left in the mirror is really right and left. In some patients the tongue is very unruly; in others it cannot be protruded sufficiently to be held. Sometimes it arches upwards, cutting off the view in the mirror. This may be due to roughness in handling, but if gentle manipulation and patience do not succeed, instead of holding the tongue down by means of a cloth one should try pressing it



FIG. 34A.—EXAMINATION OF LARYNX.
Method of holding the tongue.

down by means of a tongue spatula. The mirror being in position, and inclined a little downwards, the fourth finger of the right hand rests on the left cheek of the patient and helps to steady the mirror whilst holding the stem. A view is now obtained of the base of the tongue, with the lingual tonsil and the median glosso-epiglottic ligament, with the vallecula on either side of it. As the face of the mirror is gradually directed more downwards, so the epiglottis and larynx come into view. In fact, to examine the larynx the

same method is employed with a laryngoscopical mirror as has been described for examining the base of the tongue and adjacent parts, the only difference being that the laryngeal mirror is so placed as to face rather more downwards than before. The patient, who often has a tendency to hold his breath, should be told to breathe deeply, but as far as possible relax his throat muscles. In a favourable case, in which the epiglottis does not overhang, the true vocal cords at once strike the eye by their whiteness and their movements outwards or abduction in deep inspiration, and inwards in expiration and phonation. The cords run obliquely forwards and inwards from the vocal processes of the arytaenoid cartilages, behind to the centre of the thyroid cartilage in front, where they meet in the anterior commissure; this may be difficult to see, owing to the bulging backwards of the base of the epiglottis. Immediately above the vocal cords, on either side, may be seen the slit-like opening of a recess, the ventricle of the larynx, and above this, and nearly parallel with but external to the true vocal cords are the ventricular bands, or false vocal cords, reddish in colour, contrasting in this respect with the whiteness of the true cords; under some circumstances they act instead of these latter in vocalisation. Again, above and external to the false vocal cords are the arytaeno-epiglottic folds, extending backwards from the sides of the epiglottis to the tips of the arytaenoid cartilages, which are here surmounted by the small beak-like cartilages of Santorini, and external to these may be seen on either side the small cartilages of Wrisberg gleaming through the mucous membrane. These ary-epiglottic folds form laterally the upper border of the larynx. Anteriorly lies the epiglottis, forming the anterior portion of the upper part of the larynx, a convex form above downwards, and with its upper margin shaped somewhat like a Cupid's bow; posteriorly is the interarytaenoid space. Through the glottis or space between the vocal cords may

be seen such portion of the subglottic space as is not concealed by the cords themselves, and below this the rings of the trachea, and in favourable cases, with a good light, its bifurcation into the right and left bronchi. This subglottic region is very important, and apt to be forgotten, because less obvious, but swelling here may cause great obstruction to breathing. Whilst immediately outside the larynx there are, from before backwards, in the median line, the middle glosso-epiglottic ligament, on either side of this the depression called the vallecula, posterior to this the lateral glosso-epiglottic fold. Behind this again is a considerable recess termed the pyriform fossa, and behind this a space behind the arytenoid cartilages, and a potential space, the hypo-pharynx, between the posterior wall and the cricoid cartilage, a very common seat of malignant disease. Although some larynges are very difficult to see, it is surprising how, with steady practice, this number diminishes. With hyperæsthetic irritable conditions of the pharynx the patient should be told to take a number of short breaths rapidly, then say "E," when it will generally be found he can do so without difficulty. If not, a spray of 5 per cent. cocaine should be used. After a little time the surgeon should practise reversing his hands, *i.e.* hold the tongue with his right and the laryngeal mirror in his left hand. Sometimes the view is interfered with by the epiglottis; this is often due to the mirror not being placed sufficiently far back. If, after attention to this, success is not obtained, the patient should be told to forcibly push out his tongue. Occasionally the epiglottis may so overhang that it is necessary to hold it forward with a bent probe after cocainisation, the surgeon holding the mirror in his left hand, the patient holding out his own tongue. For operative work a stitch is sometimes passed through the epiglottis by means of a special instrument in order to retract it. Various special methods have been introduced in order to get a better view of certain

parts, such as the hypo- or lower pharynx—by dragging forward the larynx after cocaineisation, by means of a long, strong, bent probe passed through the glottis and hooked



FIG. 35.—EXAMINATION OF THE LARYNX BY KILLIAN'S DIRECT METHOD.

(With kind permission of Dr. William Hill.)

under the anterior commissure; the interarytænoid space, by getting the patient to stand erect whilst the surgeon is seated in front and beneath him and looks upwards at the mirror. Direct inspection without the laryngeal mirror is sometimes made from above by pressing forcibly on the

tongue with a spatula; or in **Killian's method**, modified by Bruning, tubes of various sizes are used, light being obtained from a small lamp attached to the handle of the instrument, and the rays reflected down; or, less commonly, a small lamp attached to the distal end of the tube itself. This method is exceedingly useful for the detection and removal of foreign bodies in the œsophagus, larynx, and trachea, and certain growths, and in various intrathoracic conditions. The parts, however, have to be thoroughly cocaineised, or the patient put under a general anæsthetic before passing the tubes, which requires some practice. The instruments are expensive, and the method cannot be recommended to those practitioners who would rarely have cases requiring it. The same remarks apply to **suspension laryngoscopy** (Fig. 36), in which the patient lies on his back, with his head

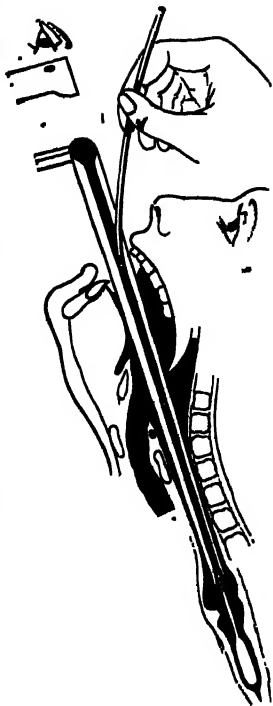


FIG. 35A.—APPLICATION OF RADIUM TO A GROWTH IN THE ŒSOPHAGUS THROUGH HILL'S IMPROVED TUBE.

hyper-extended and suspended over the end of a table. In **examining a larynx** the first thing to note is the colour of the different parts, the epiglottis being yellow or grey, the vocal cords white, the other parts reddish, also the outline of the different sections and the **movements** of the cords. Normally, on asking the patient to take a deep inspiration, the cords pass outwards into a position of abduction, whilst on asking him to say "E" they are adducted. It may be said that there are four chief positions of the vocal cords: (1) That of abduction, on deep inspiration; (2) that of adduction, on

phonation ; (3) the intermediate position of complete paralysis, which is very nearly the same as that found in the cadaver ;

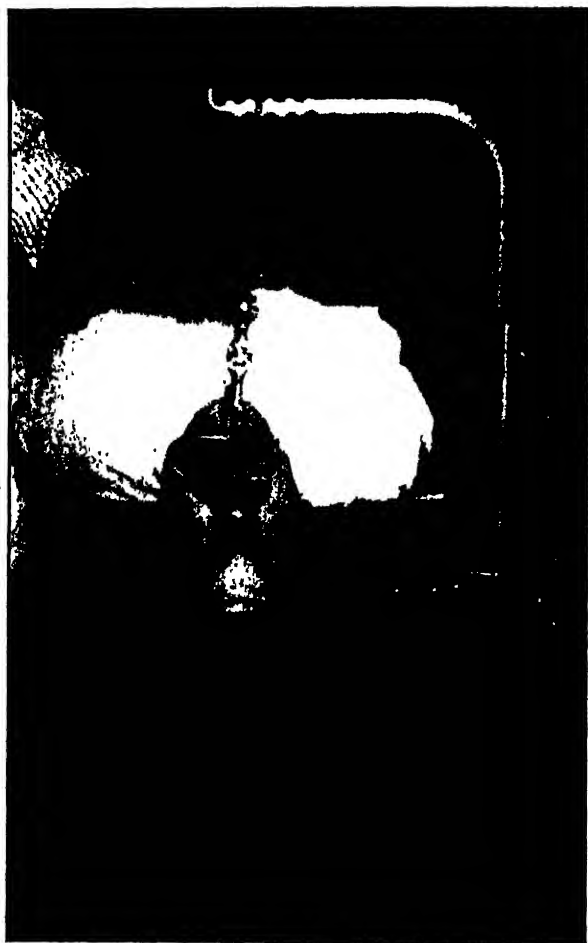


FIG. 36.—SUSPENSION LARYNGOSCOPY.

(With kind permission of Dr. William Mill.)

(4) a position termed the common respiratory position, and which is intermediate between (1) and (3).

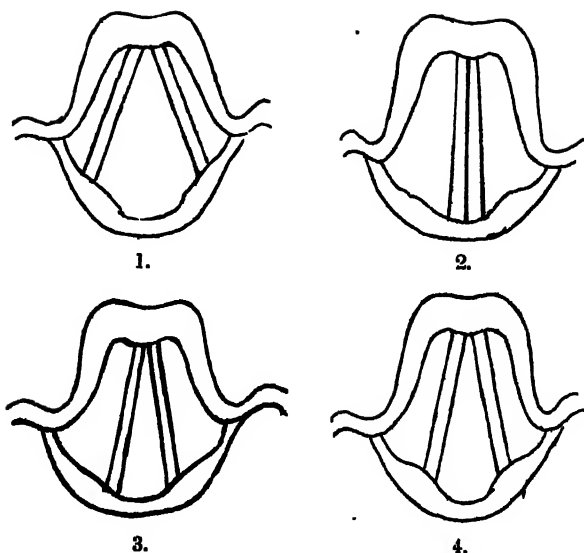


FIG. 37.—PRINCIPAL POSITIONS OF VOCAL CORDS.

LARYNGITIS.

Acute Catarrhal Laryngitis, or a cold in the larynx, is almost as familiar as a cold in the head—in fact, the vulnerability which some persons appear to have in their nasal mucous membrane others have in the larynx. Besides a chill, dust, irritating vapours, straining the voice, the fevers, the gouty or rheumatic diatheses, all have a causal relationship to acute laryngitis. Or the inflammation may spread down from the nose or up from the trachea. Also, living in badly ventilated rooms, insufficient air-way through the upper air passages, owing to hypertrophic rhinitis, deflected septa, adenoids, or other obstructive disease, an excessive indulgence in alcohol and tobacco may all act as predisposing causes. The symptoms vary a good deal in severity; in slight cases there may be only hoarseness, in others a slight rise of temperature, some malaise and feeling of soreness, with irritating cough and the expectoration of a slight

amount of mucus perhaps streaked with blood. In rare cases the laryngitis may take on a hæmorrhagic form, with spitting of pure blood, and again sometimes spasm may be present, especially in those of gouty origin. In children the symptoms are much more alarming, owing to the smallness of the parts and the greater liability to spasm, the history generally being that the child, who has gone to bed with a cold and perhaps a slight hoarseness, wakes up in an apparently serious condition—inspiratory stridor, dyspnœa, hoarseness, and a brassy cough. The symptoms, however, subside as day approaches, though they may to some extent recur. These attacks have to be distinguished on the one hand from laryngismus stridulus, in which there is neither inflammation, cough, nor hoarseness, but a spasm of the adductors, so that the child gets blue in the face and fights for breath; and from diphtheria on the other hand, in which there is gradual onset, steady progression, and the formation of membrane; also the child has less cough in diphtheria, but seems really very ill, and the presence of enlarged glands is also evidence in favour of it.

Treatment.—The patient should stay in a warm but well-ventilated room, avoid speaking; inhalations of the vapour given off by a mixture containing 1 drm. of tincture of benzoin co. to a pint of water, at 140° Fahr., give considerable relief, and so does a mustard-leaf or linseed poultice over the larynx. On the other hand, some patients get more relief from sucking ice and a cold compress; and a pastille containing heroin, morphia, and ipecacuanha gives good results. In adults, washing out the nose with warm saline solution is often useful. The bowels should be freely opened, and smoking and alcoholic drinks forbidden. It is most important, particularly for singers, that acute laryngitis should receive proper attention, so that the cure be not only rapid but complete. Patients are very apt to use the voice or expose themselves to cold too soon, thereby running

the risk of more or less permanent damage to the vocal organs

For children a steam kettle should be employed, and an emetic of ipecacuanha powder, 10 grains, or ipecacuanha wine, 1 drm., given every quarter of an hour till vomiting occurs. If the spasm is very severe a little chloroform may be administered. Rarely will it be necessary to perform intubation or tracheotomy. Small doses of ipecacuanha may be given the following day, with a view to preventing recurrence the next night. Should enlarged tonsils and adenoids be present, as is commonly the case, they must be removed as soon as the child is well enough.

Acute Septic Laryngitis.—This is generally the result of extension from the pharynx, the epiglottis rapidly swelling and presenting itself as a turban-shaped swelling. The arytenoids and aryteno-epiglottic folds also are commonly affected, losing their usual outline and becoming red and rounded. The voice at first becomes weak, and then is lost altogether, and marked dyspnoea may come on.

Treatment.—The patient must be carefully watched, as the danger of suffocation may quickly supervene. He should suck ice, and an ice-bag externally generally gives relief. Scarification of the swollen parts sometimes is necessary. Instruments for intubation or tracheotomy must be kept in readiness, the latter being the safer, unless skilful assistance is immediately within reach. The general treatment is similar to that of acute septic pharyngitis, namely, the exhibition of such drugs as quinine, perchloride of iron, strychnine, and digitalis. Light nourishment must be given in frequent small doses, and a certain amount of alcohol is generally required.

Oedema of the Larynx may occur from a number of causes, such as direct injury through hot liquids, corrosives, and foreign bodies; in the course of the fevers, such as scarlet, small-pox, influenza, and enteric; secondary, to

syphilitic, tubercular, and malignant diseases of the larynx, especially when perichondritis is set up. It is also important to remember that when laryngeal disease is treated with iodide of potassium, cedema of the larynx may be induced. For this, the internal administration of largish doses of bicarbonate of soda (1 drm.) have been recommended. Cedema of the larynx may also result from extension of the inflammation from adjacent parts of the neck; it may also be due to heart failure and kidney disease.

Treatment depends on the cause. In non-inflammatory forms, scarification, injections of pilocarpin, with general treatment as regards any visceral disease present: whilst, when due to inflammation, inhalations of steam, sucking ice, Leiter's tubes, scarification, tracheotomy, or intubation are indicated.

Angio - neurotic Cedema, though rare, is important, because, when affecting the larynx, it has proved fatal in several cases. It appears to be often hereditary, through several generations, and to be allied to urticaria. The face is often attacked first, the onset is rapid, and duration generally transient. Internal digestive disturbance is common.

The pathology is at present dubious, but it is believed by some to be a vasomotor neurosis.

Treatment.—Morphia, nitro-glycerine, strychnine have all been recommended, and sucking ice; but it must be remembered that persons subject to the disease may require very prompt intubation or tracheotomy.

Laryngeal Diphtheria.—This may be primary or secondary to the common faucial variety. When primary, it is in children apt to be mistaken for catarrhal laryngitis, and care must be taken to avoid this rather serious error. The onset of the disease is a somewhat insidious one; generally with gradual rise of temperature, to 101° or 102°, followed after a few days by a fall, perhaps below normal. The pulse rate, after a temporary quickening, tends to become abnormally

slow; the voice, at first hoarse, is lost altogether after a time; the cough rapidly becomes croupy, and membrane may be coughed up. Respiration becomes embarrassed, the intercostal spaces and epigastrium being sucked in during inspiration. The child, restless at first, becomes exhausted; its face, in the early stage congested, becomes pale, with livid lips.

The thing one would most like to obtain, in order to make the diagnosis, namely, a view of the larynx with the laryngoscope, is generally very difficult to get, and requires in most cases considerable skill; but the history of the case, examination of the pharynx, contact with known cases of diphtheria, the fact that the patient has never before had such an attack, the gradual progression of the dyspnoea, with slight pyrexia, all form cumulative evidence in favour of diphtheria. This is generally supported by the fact that the patient appears very ill, and the presence of enlarged glands. Always examine the urine for albumen, for nephritis is a common complication of diphtheria. A swab from the throat should invariably be taken for bacteriological examination. In doubtful cases isolate the patient, and always be prepared for intubation or tracheotomy. Steam inhalations and hot fomentations give much relief, but where the patients are older, sucking ice and a cold compress are often preferred. A stimulant and tonic line of general treatment must be adopted.

Herpes may affect the larynx, and should be thought of when a patient, often a gouty subject, is seized with an acute painful affection of the larynx, with moderate pyrexia, but who does not appear to be seriously ill, and in whose larynx we find on examination small round superficial ulcers on a somewhat inflamed base.

Treatment.—An aperient, followed by 10-grain doses of aspirin, with some pastilles containing menthol or boric acid, is all that will be required in the way of medicine, together

with liquid diet for a few days. When the first spots are partially or completely healed, another crop of vesicles may come out.

Chronic Catarrhal Laryngitis.—If acute laryngitis be not cured, it is apt to result in the chronic form, or this may come on gradually, without any history of an acute attack. In these cases the most common cause is an excessive use of the voice, especially in an impure, dusty, smoky, or cold and damp atmosphere, and this is particularly the case where nasal obstruction prevents nasal breathing, whereby the larynx loses its great safeguard, namely, a healthy nasal mucous membrane. Excessive drinking and smoking and chronic dyspepsia stand in a causal relationship to this affection, and so do catarrhal and suppurative diseases of the nasal and post-nasal mucous membrane and the adjacent sinuses.

The *symptoms* are more or less hoarseness, most marked in the morning; after a time the voice clears somewhat, but cannot be sustained or relied on. There is irritation, which the patient endeavours to remove by hemming, hawking, and coughing, but with only very temporary and partial success. The expectoration generally takes the form of small quantities of mucus; and an irritable cough, difficult to suppress, may be present. Appearances on examination vary. In simple chronic catarrhal laryngitis a notable change is, that the vocal cords, instead of being white, are pinkish in colour, with more or less mucus lying on them, and perhaps strings of sticky mucus stretching across from one cord to the other, also a certain amount of congestion and swelling of the mucous membrane generally.

Hypertrophic Laryngitis.—In this variety there is, more or less, general hyperplasia of the mucous membrane. The ventricular bands or false vocal cords may be so swollen as to cut off a view of the true ones; also the subglottic mucous membrane may be affected, especially in certain conditions more commonly seen abroad, as scleroma.

Atrophic Laryngitis, or **Laryngitis Sicca**, is characterised by the pale, dry, shrunken condition of the mucous membrane generally. Instead of the normal secretion there is only a little sticky mucus present, sometimes with small crusts.

Fetid Atrophic Laryngitis.—This disease, known as *ozæna*, commonly attacks the nasal mucous membrane, and is characterised by the formation of greenish-yellow crusts, with a highly offensive odour. But it may also be found in the larynx, and give the characteristic odour to the breath; there is also a danger here of these crusts, not only obstructing the air-way whilst in position, but becoming detached and falling down into the trachea and so producing suffocation.

General treatment of chronic laryngitis consists primarily in rest of the voice, together with the avoidance of impure atmospheres, alcohol, and tobacco; any rheumatic or gouty diathesis will also require treatment. Obstinate cases should be sent to one of the spas, such as Harrogate, Ems, Royat, Mount d'Or and Aix-les-Bains.

The atrophic form is but little amenable to treatment.

Local treatment.—It is necessary, in the first place, to examine the nose and make sure that there is a proper air-way and no disease there or in the post-nasal space. If any affection be found there, it is most important that it should be put right. Inhalations of vapour, *Pinus Sylvestris*, or creosote, guaiacol, terebene, or chloride of ammonium are often useful, also a fine laryngeal spray of nitrate of silver, 8 grains to the ounce, or chloride of zinc, 10 grains to the ounce, or tannin or alum, or a paint of protargol, half a drachm to the ounce, or Mandl's solution; especially when there seems to be weakness of the muscles moving the cords, massage and faradism should be tried. Where there is much secretion or crusting, as in fetid atrophic laryngitis, the larynx should be washed out with a coarse spray, using a warm solution of chloride and bicarbonate of sodium, 5 grains of each to 1 ounce of water. Lessons in voice production are of great

use, both as regards prevention and cure in the case of those using the voice much, such as singers, teachers, and the like.

Pachydermia Laryngis.—A form of hypertrophy affecting chiefly the mucous membrane of the vocal processes and the interarytænoid space, occurring chiefly, but by no means exclusively, in the middle-aged, and said to be due to excessive use of tobacco and alcohol. It is generally bilateral, appearing to the naked eye as localised thickening of the mucous membrane, and where these swellings come into contact the convex apex of one often fits into a concavity on the summit of the other. Microscopically, they are found to consist of layers of thickened and flattened epithelium, with great multiplication of the papillæ. The hypertrophies are pinkish in colour, and may be so well marked as to give the impression of somewhat pendulous folds. At the same time it is most important to note that these represent simply an overgrowth of existing parts, and not the addition of something new, as we get in tumours, cancer, or tubercle.

The symptoms complained of are chiefly huskiness and a certain amount of aching pain. Loss of voice is due in some cases to the fact that the thickenings are so marked as to mechanically prevent the cords coming together when phonation is attempted.

Singers' Nodes is the name given to small hypertrophies,



FIG. 38.—SINGERS' NODES.

generally symmetrical and situated at the junction of the middle and anterior thirds of the true vocal cords. They are white or pink in colour, and are generally looked upon as a form of pachydermia, and, as is the case with swelling of the

vocal process, one may be sometimes cupped and receive the pointed apex of the other. They are believed to be due to

chronic catarrh, straining the voice, and faulty voice production.

Treatment.—Pachydermia is very difficult to cure. The main principles, however, in the treatment are to rest the voice, to see that the nasal passages have their proper patency, and avoid alcohol and tobacco. *Locally*, applications of salicylic acid, nitrate of silver, 10 grains to the ounce, chloride of zinc, 5 grains to the ounce, may be made with a brush or swab. When singers' nodes or other hypertrophies mechanically prevent proper apposition of the cords they may be removed with advantage by cutting forceps or the galvano-cautery. The operator must be possessed of considerable skill, or more harm than good may easily be done. Operation is also indicated when the overgrowth is so great as to interfere with breathing. Iodide of potassium has been recommended internally.

Laryngeal Keratosis.—A rare disease of slow onset, the only symptom of which is hoarseness. On examination a capillary condition is seen, dead white in colour, and generally affecting both vocal cords.

On microscopical examination the patches are found to consist of layers of epithelium, flattened on the surface, but cylindrical below. In elderly patients such a case should be carefully watched as it may turn out to be malignant.

Treatment.—Excision or application of a 7 per cent. salicylic acid, by means of a swab, may be employed, but many cases are best left alone as far as local treatment is concerned.

Perichondritis of the Larynx is generally due to fevers, specially typhoid, tubercle, and syphilis, or to sepsis or injury from inside, *e.g.* foreign bodies, or from outside, *e.g.* cuts or blows. The inflammation set up in this way may either go on to abscess, the pus collecting between the perichondrium and the cartilage, or an adhesive perichondritis be set up, with thickening of the cartilage. When abscess occurs, the

nutrition of the cartilage is interfered with, and the latter is liable to necrose, the one most commonly affected being the arytaenoid. The abscess may burst externally or internally, and go on discharging till the sequestrum comes away.

Symptoms are—pain and tenderness, and a certain amount of febrile disturbance. Pain on swallowing is chiefly complained of when those cartilages are affected which are in the closest proximity to the pharynx and œsophagus, namely, the cricoid, arytaenoids, and epiglottis, whilst respiratory difficulty depends on whether the swelling is so placed as to reduce the lumen of the larynx, and death may result from this cause. The laryngeal appearances vary with the site of the inflammation. If the cricoid and thyroid are infected the swelling may be subglottic, or may be external to the larynx. In the case of the arytaenoid this body becomes red and swollen, and loses its well-defined outline, and there is loss of movement of the corresponding vocal cord, which is liable to be more or less permanent.

Treatment.—As far as possible give complete rest to the parts, insisting on silence on the part of the patient and limiting him to liquid diet. Syphilitic cases should have Salvarsan. If iodide of potassium be given, one must remember that this drug may at first increase the cedema, so that careful watching of the larynx will be necessary. The patient should remain in bed, lying in whatever position seems best to suit the cartilage affected. Ice to suck and an ice-bag externally are particularly indicated in traumatic cases. If there is a suspicion of pus having formed, an incision must be made without delay. If pointing externally, well and good; if internally, some skill will be required to guide the laryngeal knife aright with the aid of the mirror. Tracheotomy instruments must be got ready, as this operation may be required at short notice. Laryngeal stenosis is very apt to occur later on in these cases, especially where necrosis has taken place, and the treatment

of this condition is likely to be tedious and somewhat disappointing. Persevering attempts, however, should be made to dilate the stricture with Schrotter's bougies, so that the patient may not be condemned to always wear a tracheotomy tube; success is claimed for an operation in which thyrotomy is performed, the cicatricial tissue is removed, and the raw surface skin-grafted, and later on the larynx closed. Also, good results from intubation tubes of gradually increasing size have been recorded.

Inflammation of the crico-arytænoid joint is due frequently to perichondritis, but also may be due to rheumatism, gout, and such other causes as set up perichondritis. On examination there is seen to be swelling at the back of the arytænoids and also loss of movement. It may go on to suppuration, or resolution take place, with the leaving of adhesions.

Ankylosis of the Crico-arytænoid Joint may be partial or complete, but has been termed true or false according as to whether the mechanical cause preventing movement is intra- or extra-capsular. The causes of the condition are mainly those of perichondritis and arthritis. Loss of movement from this cause must be diagnosed from that due to paralysis, and fulness about the joint and rigidity are in favour of ankylosis. Also the history of the case is useful, and sometimes the expert can get assistance by using the laryngeal mirror to obtain a view, and pressing on the arytænoid by means of a bent probe, and so imparting to it passive motion, when, if free movement takes place, this points to paralysis; if there is none, to ankylosis. It must, however, be remembered that in all cases of paralysis the joint may actually become ankylosed secondarily, and the presence of cicatrices drag the parts into a distorted position.

Treatment.—This condition is but little amenable to treatment, but if the joints be ankylosed in such a position that the breathing is interfered with—for example, with the

cords adducted—tracheotomy or excision of the cartilage may be necessary. Iodide of potassium may be given to help absorption.

Dislocation of the Arytænoid occasionally occurs, and may be associated with ankylosis. Sometimes the arytænoid is actually dragged from its seat by contracting cicatricial tissue.

Tubercular Disease of the Larynx is very rarely a primary affection, but it is a common companion of pulmonary phthisis, and occurs not only in the late but



FIG. 39.—TUBERCULAR DISEASE AFFECTING THE EPIGLOTTIS, ARYTÆNOIDS AND OUTER ARYTÆNOID REGION.

also in the early stages of that disease, and one must strongly emphasise the necessity of examination of the larynx in all such cases. It is found most frequently in young adult males, and the invasion of the larynx by tubercle is generally preceded by marked anæmia of the mucous membrane, so that such an appearance, when found under laryngoscopical examination, should arouse the surgeon's

suspensions as regards tuberculosis. The same may also be said of the congestion limited to one cord, or obstinate recurrent catarrh affecting both, especially in young adults. Any part of the larynx may be affected; the epiglottis, arytæno-epiglottic folds, and the interarytænoid fold are favourite points of attack, but the vocal cords not infrequently suffer. When these are themselves affected, or cannot come together, owing to the swelling in other parts, hoarseness, varying from a slight degree to complete aphonia, is present. There is, however, a certain kind of loss of voice which is very suggestive of laryngeal phthisis. When the epiglottis or the posterior surface of the arytænoids is

affected, dysphagia is generally marked: cough and mucopurulent expectoration are common symptoms. If complicated, as it usually is, with pulmonary affection, the general condition produced by this disease overshadows that due to the larynx.

On examination, the appearances vary largely; the lesion may take the form of superficial ulceration, or an infiltration beneath the surface may occur so as to form a tumour. The epiglottis, when attacked, looks much swollen, and is often superficially ulcerated, and later on has often more or less disappeared, the stump being covered with an ulcerating surface. The aryepiglottic folds may look swollen and cedematous, and the arytaenoids appear as big, grey, glistening, rounded swellings. The interarytaenoid fold is a very favourite situation for a tumour-like form of tubercular infiltration, which is generally rather irregular in shape, and not quite in the middle line. When at the apex of the swelling irregularities in the shape of granulations are observed, it generally indicates that one is really looking at the edge of an ulcer, the base of which, owing to its position, cannot be seen. When the parts of the upper aperture of the larynx are much affected, the swelling may be so great that it is impossible to get a view of the interior, and the false cords may be affected and so swollen as to cut off the view of the true ones. Also, the true cords themselves may be involved, looking thickened, pinkish in colour, and granular, and may appear as though split longitudinally or the edges serrated. The ventricles themselves are also commonly involved, but being hidden from view, are apt to be overlooked. The vocal cords may also be defective in movement, owing to ankylosis of the crico-arytaenoid joint, atrophy of



FIG. 30A.—TUBERCULAR DISEASE AFFECTING THE VOCAL CORDS.

muscles, or paralysis of the recurrent laryngeal nerve. Only in very rare cases, except in the intra-arytænoid space, does tubercular disease in the larynx take the form of a tumour. Although more common in persons under 50, on the other hand it must be remembered that senile tubercular disease does occur, and quite a large number of cases have been diagnosed as malignant disease of the larynx which have ultimately turned out to be tubercular.

Taking everything into consideration the *diagnosis* is generally easy, bacilli in the sputa, the pulmonary signs, and the pale, cedematous-looking swellings all pointing to tubercular disease.

The *prognosis* depends largely on the lung condition. If this is not too far advanced, and can be checked, much can generally be done for the larynx, and sometimes complete cure obtained. One difficulty which has to be met is the tendency for the infection to become mixed owing to the invasion of pyogenic cocci. Although the prognosis in tubercular laryngitis is not so hopeless as formerly yet it must be looked upon as a very grave complication in phthisis, and one which is often present when not suspected, and so should be always looked for.

Treatment.—In the first place, above all, prolonged and complete rest for the voice is essential, and the routine and discipline of a well-regulated sanatorium has much to recommend it; under this régime some cases have completely recovered without any local treatment at all. The spot chosen for the patient's residence should be dry, but not at a great altitude, preferably in the neighbourhood of pine trees. Tuberculin injections in varying doses have been extolled by some, but in the hands of the majority have proved rather disappointing. In non-febrile patients localised tubercular infiltrations may be treated with marked success by galvano puncture, this apparently acting not so much by destroying tubercular tissue as by setting up a localised hyperæmia and

subsequent fibrosis. In opposition to this, in cases where there is no ulceration, it has been argued that one is making a raw surface where none before existed; but I have found this a theoretical rather than practical disadvantage. This method has largely replaced the lactic acid applications formerly in vogue, and from which I have seen very good results; commencing with a 40 per cent. solution, and working up to the pure acid, the application is rubbed in after cocainisation by means of a small swab, with the help of the laryngeal mirror; when large granulations are present, curetting may with advantage precede the application of the lactic acid. One of the most trying symptoms is dysphagia; this is most import-

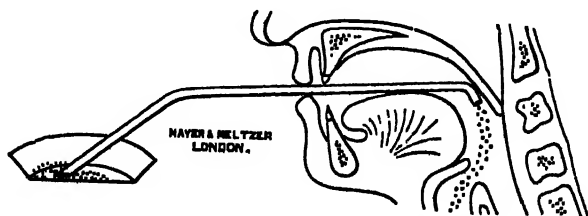


FIG. 40.—LEDUC'S AUTO-INSUFFLATOR.

ant, as it affects a vital point, namely, the nutrition of the patient, and, apart from more radical measures, having for their object the cure of the local lesions, a useful palliative is a mixture of orthoform with anæsthesin and resorcin, blown or sucked into the larynx by means of an auto-insufflator a quarter of an hour before food: this will generally enable the patient to take a satisfactory meal. Also, the method of making a steady pressure over the ears and just behind the angles of the jaw, with the flat of the hands during swallowing, relieves the pain somewhat in this, as well as in other throat affections. Also, if nourishment be taken in the prone position, swallowing will be much less painful in cases of ulceration of the epiglottis. Cocaine spray of 5-10 per cent. gives temporary relief, but the objections to the free use of a

toxic substance like this are obvious. The insufflation of $\frac{1}{2}$ grain of morphia mixed with a little starch is comforting. An intralaryngeal injection of guaiacol and menthol in almond oil is very soothing to the cough, which the patient should be told to restrain as much as possible; dry and, as far as possible, continuous inhalations of creasote vapour have also given very good results. Remarkable relief from pain has been obtained in some cases by the injection of a few drops of alcohol into the superior laryngeal nerve, just where it pierces the thyrohyoid membrane. This spot, which is known by its tenderness, having been located, the larynx being held between the forefinger and thumb of the left hand of the operator, is drawn over to the side in which the injection is to be made, the tip of the said index-finger marking at the same time the spot at which the needle must be introduced. This should be done at right angles to the skin, and the point should not be inserted for more than a quarter of an inch. Sharp pain in the ear indicates that the position of the nerve has been correctly hit off. Five drops of alcohol are then injected; this produces temporary increase of pain, which very gradually passes off. The procedure above described may be repeated. The total amount of drops should be about 1 cm. of 80 per cent. alcohol. A special needle is used with the point so obtuse as not to damage the artery which accompanies the nerve. Duration of relief varies greatly; it may be for months. Removal of the epiglottis with punch forceps has been extensively performed in some quarters, but experience shows that this somewhat drastic measure is advisable and likely to be of permanent benefit in only a small proportion of cases, such as when extensive disease, fairly limited to the epiglottis, is producing intolerable dysphagia, milder methods of treatment having been tried in vain. The desirability of performing tracheotomy in these cases, unless an absolute necessity, is doubtful, since, although the operation gives beneficial rest to the part, it complicates matters

by producing an external wound communicating with the tubercle-laden trachea, and is likely to become infected. Finsen light, X-rays, and radium have all been tried, but cannot be confidently recommended at present. Bier's bandages have also been used, applied to the neck in the form of a rubber band an inch wide, passing horizontally round the neck below the larynx. This is made as tight as can comfortably be borne, and is worn for periods of increasing duration, from six to twenty-four hours. The pain is relieved, but, since cedema at first increases, much care is necessary.

Lupus of the Larynx, though a form of tuberculosis, is very different clinically from the affection just described. It is a somewhat rare disease, and may or may not be associated with lupus in other parts, such as the skin, mucous membrane of the nose, palate, or gums. It begins generally in young adults, and runs a very chronic course. The symptoms are chiefly hoarseness and dyspnoea, due to stenosis of the air-way. Pain is generally absent, and there may be no obvious symptoms, the disease being discovered in the course of a routine examination. The epiglottis is very frequently attacked, and so are the true and false vocal cords and the interarytænoid space. Small, pinkish nodules form, and the affected parts are gradually eaten away, but, as in other parts, noticeable points are the absence of distinct ulceration and very little discharge. On the other hand, thickening of the parts and cicatricial contraction are well marked. The disease is not often difficult of diagnosis; its extreme chronicity, lupus in other parts of the body, absence of ulceration, and the pinkish nodules, make it unlike anything else.

Treatment.—The general treatment must be tonic, arsenic in gradually increasing doses giving good results in some cases. The disease is one in which relapses are exceedingly liable to take place after marked improvement having occurred. Sometimes, however, a cure is effected, but a good many ultimately die of phthisis.

The local treatment is very similar to that of ordinary tubercular disease, namely, curetting and rubbing in of lactic acid, also the galvano-cautery. In two cases I have found great benefit from tracheotomy. In these patients there was no infection of the wound, which healed immediately the tube was taken out. X-rays and Finsen light have been found useful.

Syphilis of the Larynx may be hereditary or acquired. The HEREDITARY form generally first shows itself in early life as a laryngeal catarrh; later on, changes more nearly resembling tertiary syphilis may show themselves. In the case of a girl about 12 years of age, whose case came under the care of the author, and who had well-marked indications of hereditary syphilis in her teeth, eyes, and ears, there were tough, fibrous masses of tissue in the larynx which interfered with the voice and respiration.

ACQUIRED SYPHILIS.—Primary sore in the larynx is almost unknown. Laryngeal catarrh occurs as an early secondary manifestation, and is notable chiefly for its obstinacy to all remedies except anti-syphilitic ones, to which it readily yields. A mottled appearance of the mucous membrane of the larynx may be present, due to a patchy, ill-defined erythematous rash. Condylomata and mucous patches may occur, but are not common. Superficial ulceration is an early symptom, whilst deep ulceration is seen later, owing to the breaking down of gummata or diffuse infiltration. Perichondritis may occur, and neoplasms in the form of papillary and nodular outgrowths, and later cicatrices, adhesions, fibrosis, and paralysis.

It is always important to remember that although we find it convenient to term certain manifestations of syphilis secondary, which are, as a rule, early, superficial, symmetrical, and transient, and others tertiary, which are later, deep and asymmetrical, there are numerous exceptions to this, for the so-called secondaries may be by no means transient and may

recur obstinately and the tertiary may be early instead of late; also, one sometimes finds lesions having secondary characteristics present at the same time, with others more like tertiary phenomena.

The gumma, which is the type of tertiary syphilides, may appear at any part of the larynx. The epiglottis and ventricular bands are common situations, the true cords are not so commonly affected; it appears as a more or less rounded, dusky red swelling which, if untreated, tends to become yellow in the centre and to break down, leaving a deep punched-out ulcer with sharply cut edges and yellow slough at its base. Deformity and stenosis are very apt to follow on after the ulceration has healed. Sometimes the syphilitic infiltration takes a more diffuse form; this may break down and ulceration occur, or a fibroid change take place. Perichondritis may supervene and is apt to be associated with necrosis.

In the early or superficial stages of the disease hoarseness is the chief thing complained of; later on, when the deep, destructive lesions occur, there may be complete loss of voice and dyspnoea from swelling, contraction, or distortion of the parts; pain may be present, but is not a prominent symptom in the vast majority of cases. The prognosis must be guarded when the larynx is attacked by tertiary syphilis, as not only is permanent damage often done to the voice, but the air-way may be so interfered with as to necessitate the permanent wearing of a tracheotomy tube. The dusky red colour, the punched-out ulceration, and yellowish slough, together with the history and perhaps presence of syphilitic lesions in other parts of the body, all point to the diagnosis in a case of syphilitic disease; mixed cases of tubercle and syphilis occasionally occur.

Treatment.—Salvarsan or neo-Salvarsan will usually be the drug used, given intravenously in repeated doses, and in conjunction with this mercury may be given as an adjuvant.

Inunction and the intramuscular injection of grey oil have the reputation of being the most effective methods of administering it.

In tertiary lesions rapidly increasing doses of iodide of potassium, commencing with 5 grains and rapidly rising to 1 drm. three times a day, has often a striking effect; but with regard to this the warning must be once more repeated that the laryngeal swelling and consequent stenosis may be temporarily increased thereby. A combination of mercury with iodides of potassium and sodium sometimes acts better than either alone, also a decoction of sarsaparilla seems to assist the action, although thought by some to be quite inert. Local treatment is generally but little needed, the insufflation of a little calomel or iodoform may be tried; and in special cases pus may have to be let out, œdema incised, sequestra removed, or stenosis dilated.

Scleroma and leprosy of the larynx are so rarely seen in this country as to be looked upon almost as curiosities. A notable point about scleroma is, that the principal seat of its lesions, which consist of pinkish, smooth indurations, is below the true vocal cords. In leprosy nodular swellings occur which ulcerate, but in both diseases the diagnosis is generally made from lesions on the face or other parts of the body, combined with bacteriological examination.

MALIGNANT DISEASE OF THE LARYNX.

The cause of malignant disease of the larynx is unknown; but it occurs much more frequently in males than females, except that the extrinsic form affecting the cricoid plate is more common in women; most cases occur between the ages of 50 and 60, but these are by no means the limits. The charge that the irritation set up by repeated laryngeal operations may convert an innocent into a malignant growth has been shown to be groundless. Sarcoma, as well as carcinoma, may be found in the larynx, but the former is very

much rarer; when it does occur it is generally as a round-celled, spindle-celled, or lympho-sarcoma, and presents itself as a smooth, more or less rounded swelling. CARCINOMA is almost always of the squamous-celled variety. Researches on the lymphatics of these parts have brought out the important fact that those in the interior of the larynx are practically a set by themselves, anastomosing very little with those outside, but emptying themselves into small glands on either side, one below the greater cornu of the hyoid bone, the other by the side of the trachea.

The lymphatics of the interior are distributed to the ventricular bands, the ventricles, the true vocal cords, and the subglottic region; growths confined to this area are termed **INTRINSIC**; whilst those of the epiglottis, arytaeno-epiglottic folds, arytaenoid, interarytaenoid region, and posterior surface of cricoid, are termed **EXTRINSIC**.

Obviously a growth originally *intrinsic* may extend and become *extrinsic*. Fortunately the intrinsic growths often remain confined to the larynx for a long time, also this division is more commonly met with than the extrinsic variety. The signs and symptoms of this disease depend largely on the position of the growth. In intrinsic cases hoarseness is apt for a long time to be the only symptom, and in the early stage laryngoscopic examination may not reveal much, owing to the insidious character of the disease; perhaps congestion on one side or slight swelling, together with some loss of movement of one cord, may be noted.

A favourite seat of the disease is the posterior two-thirds of the true vocal cord. As in other parts of the body, a tendency either (1) to infiltrate, or (2) to grow outwards forming a warty tumour, usually sessile, may predominate, and this latter lesion is often surrounded by a hyperæmic area. Sometimes the growth is distinguished by a peculiar whitish appearance. Pain is very variable, it may be almost

absent at first, but it may become severe and shooting up to the ears as the case progresses. The neighbouring glands become involved as the disease increases and ulceration takes place, a foul, dirty sore being formed, with a tendency to bleed, and this, extending still deeper to the cartilage, may produce perichondritis, suppuration, and necrosis. If the epiglottis or posterior surface of the cricoid or arytaenoids are affected, marked pain on swallowing is often produced. Cough is generally slight; tenderness on external pressure may sometimes be detected, and sometimes increase in width of the larynx as the growth gets larger—a very suspicious sign. With the advance of the



FIG. 41.—EPITHELIOMA OF VOCAL CORD.

disease, increase of salivation is noted, and associated with ulceration a peculiar foetid odour is given to the breath, and the patient becomes cachectic. Generally, within three years the patient dies, if untreated—most commonly of lung disease, exhaustion, or heart failure.

Treatment.—In doubtful cases it is the custom to give iodide of potassium in increasing doses, and, if possible, to remove a piece of the growth for examination. Unfortunately, it may be difficult to obtain a portion sufficiently thick to show definitely the nature of the growth, and to merely skin the surface is worse than futile.

When the signs and symptoms above mentioned point fairly clearly to a case of early intrinsic cancer, no time whatever should be lost, but thyrotomy performed and the disease removed by incision well beyond its limits. Not only do patients make good recoveries after these operations, but the voice is gradually restored in a most remarkable way. Should the diagnosis prove to be incorrect on opening the larynx, as sometimes happens, no great harm will have

been done. Most brilliant results have been obtained in early cases of intrinsic cancer by the free removal of the growth after thyrotomy, permanent cure resulting in a large proportion of cases; intralaryngeal operation cannot be recommended as a curative measure. If the disease, though extrinsic, is not considered inoperable, the patient will have probably to face the loss of half or the whole of his larynx, and even then it is roughly ten chances to one against his being alive without recurrence at the end of three years; also total laryngectomy will at best leave him badly maimed, with loss of voice and difficulty in swallowing, and necessitate his wearing a tracheotomy tube for life. If no radical operation is to be performed, we can only hope to smooth his pathway to the grave by means of a low tracheotomy, radium, cocaine anæsthesia, orthoform anæsthesin, and morphia.

Since one of the commonest and yet most important problems presented to the throat specialist is the differential diagnosis of cancer, tubercle, syphilis, and simple inflammation when affecting the larynx, it may be useful, before leaving this subject, to emphasise a few points, owing more especially to the extreme importance of early diagnosis in cancer.

1. If congestion and swelling in the larynx be unilateral our suspicions should be aroused as to the presence of something more than ordinary inflammation.
2. Slight swelling of a vocal cord, associated with loss of movement, especially in a patient past middle age, is suspicious of malignant disease, and so also is a growth looking like a simple papilloma.
3. Cancer in the region of the posterior surface of the cricoid cartilage may occur in young women; I have seen it at the age of 20.

4. Combinations of tubercle and syphilis may occur.
5. Cancer may be engrafted on syphilitic disease.
6. Malignant growths are occasionally multiple.
7. Tubercle being, on the whole, more common than either syphilis or malignant disease, an atypical case, other things being equal, usually turns out, in my experience, to be tubercular in the end.
8. Pachydermia, when well marked, often presents at first sight a startling appearance. Careful examination, however, will show that the changes are superficial, and that there is no deep infiltration, such as we find in malignant disease.

NON-MALIGNANT TUMOURS.

The etiology of these tumours, as may be surmised, is unknown. Papillomata, fibromata, and cysts are the most common out of a long list. The symptoms they produce may be summed up under two headings, namely, loss or alteration of voice and obstruction to respiration; and these may be absent altogether, and come on either gradually or suddenly, with symptoms depending on the position of the tumour; and also a tumour, if pedunculated, may be suddenly drawn or forced from a safe position into a dangerous or even fatal one, completely blocking the air-way.

Papillomata may occur at any age, but are most common in the young; they may be single or multiple, and vary greatly in size, from a pin's head to a cherry, or larger. They are whitish or pinkish in colour, and look like miniature cauliflowers. They may grow from any part of the larynx, but the anterior two-



FIG. 42.—PAPILLOMATA OF LARYNX.

thirds of the vocal cords and the anterior commissure is a favourite seat, whilst, on the other hand, they rarely arise from the epiglottis or inter-arytænoid space. An extraordinary feature is the way—like warts in other parts of the body—they sometimes spontaneously disappear, and fresh ones show themselves.

Fibromata are generally single, and occupy the anterior or middle portion of the vocal cords. They may be pinkish, white, or grey in colour, and semi-translucent if œdematous, or if they have undergone myxomatous degeneration. Sometimes they may be angiomatous, when they are blue or red, or they may have acquired these colours from hæmorrhage. They are usually more or less spindle-shaped, and vary in size from a millet-seed to a good-sized gooseberry; they are generally sessile, but may be pedunculated, and when the peduncle is a long one, as is sometimes the case, they may disappear and reappear in a mysterious way, being drawn down between the cords on inspiration, and appearing from below like a jack-in-the-box on violent expiration or coughing. Some remarkable cases of large fibromata, extending into the larynx from the neck, have been recorded, passing through the crico-thyroid or thyrohyoid membrane. They give rise to doughy swellings, the exact nature of which it is not easy to diagnose before operation.

Cysts are chiefly of the mucous variety. Their commonest seat of origin is the epiglottis.

Anglomata may occur on any part of the larynx.

Other rare tumours are *lipomata* and *enchondromata*.

Treatment.—As regards papillomata, the rapid way in which these growths recur after removal makes the treatment rather tedious: they may be removed with Grant's or Mackenzie's forceps by the indirect method; or, if preferred, the direct method with Bruning's tubes may be used. A case of this kind provides excellent practice for the young operator,

as the way the crops of these papillomata go on reappearing in some cases is most remarkable. Sometimes the operative séances have to be repeated many times, so that the question of employing some other method more permanently effectual arises. Tracheotomy itself is believed by some to cause the growths to disappear; on the other hand, they may sprout out on the edges of the wound. Thyrotomy, although it gives such good access, had better be avoided, owing to the risk of injuring the voice. Usually the best method, after all, is to be patient and go on removing the papillomata by means of internal methods, either direct or indirect, waiting for the happy moment when no more will reappear. Much care, of course, must be taken not to damage the surrounding parts by unskilful instrumentation.

As regards other innocent growths, if the tumours are not increasing in size, and are not in such a position as to interfere with either respiration or the voice, it may be best to do nothing but watch the case. If, however, the patient happens to reside in a region where he cannot get expert assistance, or there be interference with the voice or air-way, the growth should be removed if possible by endo-laryngeal methods, but if not, by thyrotomy. Sometimes a fleshy mass appears, protruding itself from the opening of the ventricle on one or both sides of the larynx; to this the term *prolapse* has been given, though whether the wall of the ventricular sac is ever completely inverted is a matter of dispute; but part of it may become swollen and cedematous and project from the orifice, or a somewhat similar appearance may be given by a growth growing out from the cavity of the ventricle. In the case of complete inversion, it would obviously not be possible to get a bent probe up into the cavity of the ventricle, as can be done in normal conditions. The protrusion, if interfering with vocalisation, should be removed with forceps, snare, or cautery.

FOREIGN BODIES IN THE LARYNX.

The cases may be divided, as regards treatment, into two groups—

- (1) Very urgent cases; and
- (2) Not very urgent.

(1) In urgent cases, asphyxia being threatened, the finger should be rapidly introduced into the pharynx and swept round. If ineffectual, this may have to be followed by immediate tracheotomy. Inversion and slapping the back may be tried if there is time.

(2) In the second group of cases careful examination with the laryngoscopic mirror should first be made. Bruning's tubes have enabled the surgeon to successfully locate and remove numerous foreign bodies, very markedly reducing the previous mortality from this cause. The same success has attended also the removal of foreign bodies from the œsophagus by the direct method. The X-rays are exceedingly valuable in showing the position of such bodies as are opaque to them. A Röntgen ray photograph should always be taken should a mysterious affection of the lungs come on, with cough, expectoration of blood and pus, perhaps having a foetid odour, particularly if the abnormal pulmonary signs are limited to one side, since in children no history may be obtainable, and in adults sometimes it is supposed that the foreign body has been swallowed when it has really passed into the air passages.

CONGENITAL DEFECTS AND MEMBRANES.

Congenital Defects and Membranes are rare. The latter usually are found across the anterior portions of the cords, in the form of a web, or, it may be, lying below them, and extending backwards a variable distance from the anterior commissure. Should they interfere with the respiration or phonation they should be removed, but not otherwise. There

is a marked tendency to relapse after apparent cure by operation.



FIG. 43.—CONGENITAL WEB JUST BELOW ANTERIOR PART OF VOCAL CORDS.

Bifid Epiglottis also sometimes occurs, and, rarely, want of union between the two sides of the thyroid cartilage.

NEUROSES.

Motor.—The nerve supply of the larynx being—(1) The external branch of the superior laryngeal branch of the vagus to the external muscle, namely, the crico-thyroid, the action of which is to tighten the vocal cords; (2) the recurrent laryngeal branch of the vagus to the abductor muscles, namely, the crico-arytænoidei-postici, also to the adductors, namely, the arytænoideus and the crico-arytænoïd lateralis, and the thyro-arytænoideus internus: this last is a complicated muscle, consisting of different parts, going in different directions; but if it be paralysed, the margins of the glottis are no longer straight lines, but curved, so that vocalisation is interfered with. In animals, and later in man, centres in the brain both for adduction and abduction of the vocal cords have been found, and stimulation produces bilateral adduction and abduction. Semon's law shows that in all progressive organic lesions of the centres or trunks of the motor laryngeal nerves the abductors succumb, and are affected much earlier than the adductors; the result of this

is that the affected cord is at an early stage of paralysis in the adducted position or middle line. Note that stimulation of the peripheral end of the cut recurrent laryngeal nerve results in adduction of the corresponding vocal cord.

Spasm of the Glottis in Children is well exemplified by the well-known disease *laryngismus stridulus* (p. 87).

Spasm of the Glottis in Adults may be very slight, or so severe that consciousness is lost, or even death has ensued. It is generally reflex, due to such causes as foreign bodies, adenoids, aneurism, mediastinal growths, and also to central lesions, as in locomotor-ataxy, hydrophobia, tetany, and hysteria. In hysteria sometimes the proper order of things in respiration seems in a way to be reversed, the vocal cords coming together on inspiration (functional respiratory spasm) instead of separating as usual, but, on the other hand, separating somewhat on expiration.

Treatment of the Spasm.—Cold effusions should be tried, and freeing the neck from everything tight. Sometimes the hot douche is more effective. Smelling-salts should be applied to the nose. In severe cases, where asphyxia appears to be actually imminent, tracheotomy must be performed.

As regards general treatment, the first point is to see that the bowels are freely acting, and then satisfy oneself that the digestive organs are working well. Bromide of potassium may be given as a palliative; tonics, such as iodide of iron and cod-liver oil, are sometimes very beneficial, especially if the subject is rickety. In hysterical cases valerianate of zinc and the faradic current externally to the laryngeal region are useful.

TREMOR OF THE VOCAL CORDS.

Tremor of the Vocal Cords occurs in chorea, disseminated sclerosis, paralysis agitans, syringomyelia, and hysteria; also certain rhythmic involuntary movements occur in rare cases.

Phonic Spasm is a condition allied to writer's cramp, in which the patient, usually a neurotic professional speaker, on attempting to address his audience, gets spasm of the adductors, and is unable to do so owing to the spasmodic closure of the glottis, which ceases with cessation of the attempt at phonation. The voice of the individual becomes very peculiar, but the respiration is unaffected.

There is also an affection characterised by the loss of power to sing or raise the voice, ordinary conversation being unaffected, and **phonæsthesia**, in which extreme weakness of the voice is present on any attempt to speak.

Treatment.—Breathing and speaking exercises are the most helpful curative agents in these difficult cases. Rest and massage have been advised.

The **Laryngeal Cough of young Adults**, without visible lesion, seems sometimes to come under the heading of laryngeal neurosis; it is loud, hard, and persistent and purposeless.

Treatment.—A sea-voyage has been highly recommended, or, failing that, bromides, sulphate of iron, or weak cocaine sprayed locally.

CONGENITAL LARYNGEAL STRIDOR.

A somewhat rare affection, beginning at or soon after birth, increasing for the first few months, and then disappearing towards the end of the second year. The stridor is inspiratory, and becomes loud and crowing when deep breaths are taken. The child's cry is normal, and it generally seems in good health, but there is marked indrawing of the suprasternal notch and epigastrium during inspiration. Cyanosis is rare.

Different views are held as regards the etiology of this stridor. A flaccid condition of the parts, due to mal-development, so that the epiglottis folds on itself, and the aryteno-epiglottic folds are approximated, is considered to be the

cause by some. Others, however, believe that a disturbance of co-ordination of respiratory movements of nerve origin is present.

Treatment.—Local treatment is futile, but the stridor disappears gradually of itself, and beyond supporting the strength of the child, there is very little to be done.

LARYNGEAL VERTIGO.

A rare form of spasm of the glottis, which appears to be allied to epilepsy. The patient, after a short fit of coughing, becomes giddy, and may fall to the ground unconscious for a few seconds, and becomes cyanosed. There is no inspiratory stridor. Suddenly the attack ceases; the phenomena may be considered due to the action of forced inspiration with a closed glottis. The attacks tend to recur at varying intervals.

Treatment.—General tonic treatment, with rest and change, is indicated, also nerve tonics, such as arsenic, have sometimes proved useful. Bromide of potassium will reduce the frequency of the attacks. Any local cause of irritation, such as adenoids, diseased tonsils, or granulations, should be removed.

The prognosis is good, the liability to attack gradually diminishing.

LARYNGISMUS STRIDULUS.

Laryngismus Stridulus generally occurs in rickety children under 2 years of age. A number of possible causes of reflex adductor spasm have been suggested, such as worms, scybala, dentition. The history of an attack is that the child suddenly ceases to breathe, gets blue in the face, and then inspires with a crowing noise. The disease may assume a severe form, and spastic contractions of the hands and feet, convulsions, and even death, occur.

The *treatment* lies in attempting to cut short the spasm with a douche of cold water or hot sponging. Chloroform vapour may be useful for this purpose. As regards after-treatment, to prevent further attacks it is important that the child should be kept very quiet, and drugs, such as chloral, bromide of potassium, and antipyrin may be given; but, above all, it is necessary to treat the underlying condition of rickets.

PARALYSIS.

Motor Paralysis.—It may be taken as a general rule that paralysis of the abductors alone is due to organic disease, whilst paralysis of the adductors alone is due to hysteria.

Paralysis of all the Muscles supplied by the Recurrent Laryngeal Nerve.—This is the most common form, and it will be remembered that this nerve, coming off from the vagus and passing round the subclavian artery on the right side, and the aortic arch on the left, on its way back to the larynx, has, especially on the left side, a very long course, and is liable to pressure from various sources. The causes of recurrent paralysis are numerous. They may be divided into—

1. A central group including tabes, general paralysis, disseminated sclerosis, bulbar paralysis, syringomyelia, hæmorrhage and softening, tumours, syphilitic and tubercular disease; but further evidence is required with regard to the question of lesions of the central nervous system above the medulla producing this form of paralysis.

2. Peripheral affections, including aortic aneurism, cancer of the œsophagus, peripheral neuritis, and pachymeningitis; traumatism, mediastinal tumour, pericarditis, pleurisy, enlargement of the left auricle in mitral stenosis; neuritis from catarrh, influenza, rheumatism, or alcohol, and from certain metallic poisons, such as lead.

The examination of statistics on this subject plainly brings out certain facts :

1. That, of all causes, aneurism is the most common.
2. That laryngeal paralysis is much more common in men than in women, and more common on the left side than on the right.
3. In women, aneurism is much less common, but in them malignant disease of the œsophagus and goitre come to the front as causes.
4. There is still a considerable number of cases in which the cause of the paralysis is undiscovered, but the number has been very much reduced since the X-rays have been available for diagnostic purposes.

The Signs and Symptoms of Single Recurrent Paralysis.

—As the result of Semon's law, in the early stages the abductors being first weakened, then paralysed, the adductors being unopposed, the cord on the affected side lies motionless in the middle line. Thus the voice is not interfered with at all, or there may be very slight hoarseness, and possibly slight stridor, with a little dyspnoea on exertion when the abductor paralysis is complete.

On making a laryngeal examination, during phonation nothing abnormal is to be observed, but during respiration or deep inspiration the failure of the affected cord to move outwards is obvious. If the case goes on to complete paralysis, the cord assumes a position intermediate between abduction and adduction, and which, strictly speaking, is a little internal to that which it occupies in the dead body.

The voice is now interfered with, but to a variable extent, as the other cord may come to the rescue, and crossing over to its paralysed companion help in phonation, the glottis being in this case oblique instead of directly antero-posterior; not only is there abduction of the paralysed cord but its free edge is bowed from paralysis of the thyro-

arytænoideus internus muscle, also the arytænoid cartilage looks more prominent than usual, being dislocated a little forward; it also moves a little on attempting phonation because the arytænoideus muscle is not wholly paralysed: there is no respiratory distress! The prognosis is good, generally speaking, when the cause is neuritis, due to cold, rheumatism, influenza, and diphtheria; but, unfortunately, in some cases it is very difficult to be certain as to what the cause exactly is, and one cannot say much more than that the prognosis is considerably less gloomy if, after careful examination, we are unable to find any trace of such serious disease as aneurism, malignant disease, or tabes.

Paralysis may have to be diagnosed from ankylosis (*vide* p. 67) and rarely from loss of movement due to muscular atrophy, when the wasted condition of the parts, showing the bare outline of the cartilages, will assist.

Treatment depends on the cause, which is obviously the first thing to think of; in doubtful cases, iodide of potassium should be given. In cases due to neuritis, strychnine, cod-liver oil, and the faradic current may be tried.

Bilateral Paralysis is much rarer than unilateral, but may have similar etiology, the lesions, however, being more extensive, also cases have been recorded in which pressure on only one vagus appeared to produce bilateral paralysis. The principal signs and symptoms are as follows: the cords being both adducted in the early stage there is marked inspiratory stridor, especially on exertion, and this is more or less audible during sleep. These patients are in great danger of asphyxia. When the condition has passed on to complete paralysis the voice, previously not far from being normal, becomes markedly affected, but the breathing is relieved.

Treatment.—A patient with double abductor paralysis will not be safe from the danger of asphyxia till tracheotomy has been performed; in other respects the treatment is the

same as in unilateral paralysis. When the lesion of the vagus is above the origin of the superior laryngeal nerve there is loss of sensation, affecting the mucous membrane of the larynx, and also paralysis of the crico-thyroid muscle, which normally puts the vocal cords on the stretch, the result being that the outline of the free margin of the cord is wavy instead of being straight.

Paralysis of the Abductors—*i.e.* the CRICO-ARYTÆNOIDEI POSTICI MUSCLES—occurs in the first stage of recurrent paralysis, and has already been described. Seeing how much alike the words ABDUCTOR and ADDUCTOR are, although opposite in meaning, it is better to avoid confusion when speaking on this subject, and to use the term POSTICUS PARALYSIS instead of ABDUCTOR PARALYSIS.

Paralysis of the Adductors, namely, the CRICO-THYROID, the ARYTÆNOIDEUS, the CRICO-ARYTÆNOIDEUS LATERALIS, and some fibres of the THYRO-ARYTÆNOIDEUS INTERNUS. This, when occurring by itself, and not merely a part of a completely recurrent paralysis, is always hysterical, and it may be associated in some cases with laryngitis; but it must also be remembered that well-marked paresis may be caused by inflammatory infiltration of the muscles. The onset is generally sudden, and the voice is reduced to a whisper, or there may be no voice at all; but the cough, on the contrary, is quite loud. Vocalisation may return as suddenly as it went.

The prognosis is good, but the duration of the affection is uncertain, and relapses are common. Of the three adductors each produces rather a different result by its action on the cords: the crico-arytænoides lateralis brings the cords together by rotating the vocal process inwards; the arytænoides muscle by bringing the arytænoïds towards each other; the thyro-arytænoides internus, by acting as an internal tensor, and so tightening the cords, thus tending to bring them into the middle line. The shape of the glottis

and the interarytænoid space varies with the muscle paralysed. If the crico-thyroid or thyro-arytænoid, *i.e.*

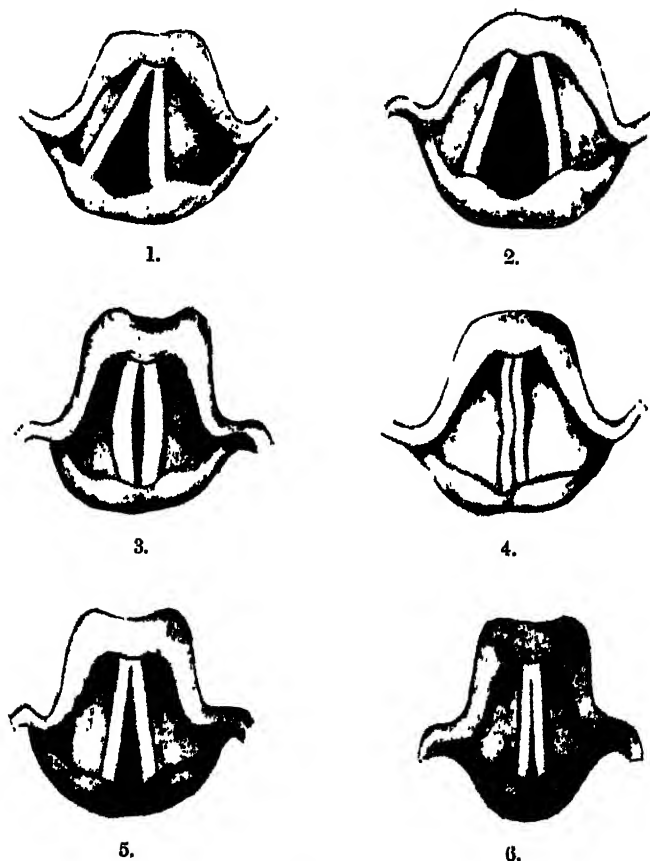


FIG. 44.

1. Abductor paralysis, left vocal cord ; 2. Complete paralysis, left vocal cord ; 3. Paralysis of the internal tensors (thyro-arytænoides internus muscles) ; 4. Paralysis of the external tensor (crico-thyroid muscles) ; 5. Paralysis of the crico-arytænoides lateralis muscles ; 6. Paralysis of the arytænoides muscles.

the external and internal tensors of the cord be paralysed, we get a slack, bowed, wavy condition of the glottis. If the arytænoid muscles are affected, a triangular space is left behind the vocal processes when the cords are adducted. If

the lateralis is affected the normal rotation of the vocal process does not occur, and so they are not brought together, and a somewhat diamond-shaped glottis results.

Treatment.—The best local treatment for hysterical, or adductor, paralysis, is the faradic current, applied either with both poles placed externally, or, better, one internally in the larynx and one externally. This is a very successful treatment, but just occasionally fails. In the absence of this means of treatment a brush or swab dipped in cold water and used to swab out the larynx is generally effective; at the same time the operator suggests to the patient her saying “Ah,” or “E,” in a loud voice. If a relapse takes place, this treatment must be repeated.

Treatment for the catarrh, if any, should not be forgotten. Many of these cases are suffering from mental strain, shock, and nervous exhaustion, and will require proper rest, change, and probably nerve tonic or sedatives, such as zinc, valerianate, arsenic, and bromide of potassium.

SENSORY NEUROSES.

The sensory nerve to the larynx being the superior laryngeal branch of the vagus, loss of sensation here means its involvement in some part of its course, and, like motor paralysis, it may be bilateral or unilateral, and of central or peripheral origin, and the causes are the same as those which affect the recurrent laryngeal before it leaves the vagus, and, in fact, anæsthesia of the larynx is not infrequently associated with paralysis. The loss of sensation may be partial or complete, and there may be anæsthesia of other parts, such as the palate.

The symptoms are due to the fact that food and drink are liable to enter the larynx and pass down the trachea to the lungs, without setting up the violent reflex expulsive efforts which help to prevent the intrusion of particles under normal conditions, the result being that a kind of

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pneumonia is apt to be set up. Also, in the same way, a large bolus may enter the larynx, and, blocking the air-way, produce asphyxia.

The diagnosis is made by going over the parts with a probe. When the insensitive areas are touched, the patient feels nothing, neither is coughing nor retching set up.

The prognosis depends entirely on the cause. Transient causes generally mean transient anæsthesia, *e.g.* diphtheria; and *vice versa*, *e.g.* tabetic degeneration.

Treatment.—The chief point is to feed the patient in such a way that food does not enter the larynx. For this purpose a soft tube may be carefully introduced into the œsophagus: in some cases faradism apparently does good. Strychnine injections may be tried hypodermically. If there is a history of syphilis, especially if there be a positive Wassermann reaction, anti-syphilitic remedies must be used. In hysterical persons all kinds of odd sensations may be felt in and round about the larynx, such as burning, swelling, weakness, and the like. When, however, an examination is made, the parts may appear to be quite normal. Some kind of relationship to gout and uterine affections exists, no doubt, in many of these cases, but this must not be confused with the hyperæsthesia of true gouty catarrh.

General treatment should be along the lines of in every way trying to improve the general health, by change of air, scene, exercise without fatigue, and nerve tonics, such as valerianate of zinc, iron, and arsenic and phosphorus.

II.

THE NOSE.

BEFORE commencing our study of diseases of the nose let us call to mind a few fundamental points in anatomy and physiology.

The head being in the erect position, the *inferior meatus* is the space between the inferior turbinate body and the floor of the nose, and into its anterior-superior angle opens the nasal duct from the lachrymal sac. The *middle meatus* is the space between the middle turbinate above and the inferior below, and into it open directly or indirectly the frontal sinus, the anterior-ethmoidal cells, and the antrum of Highmore. These openings are largely concealed by the overlapping middle turbinate. The superior meatus between the superior and middle turbinate contains the opening of the posterior-ethmoidal cells, whilst above and behind the superior turbinate is the opening of the sphenoidal sinus. Besides these three turbinates, additional, more or less developed, ones may be present; *eg.*, just in front of the middle turbinal is a ridge termed the *agger nasi*, which is the rudiment of a well-developed turbinal in animals. This contains a cell, the *agger cell*, and is of importance as tending to obstruct the route from the frontal sinus into the nasal cavity, and corresponds more or less to the position of the lachrymal sac, which lies external to it.

The septum is made up from behind forwards of the vomer, with, at its posterior-inferior angle, a small portion of the palate bone, the perpendicular plate of the ethmoid, the superior maxilla below, and the quadrilateral cartilage of the septum ;

this cartilage, thinner at the centre than at the periphery, unites posteriorly with the perpendicular plate of the ethmoid, and its anterior-inferior angle is in contact with the incisive

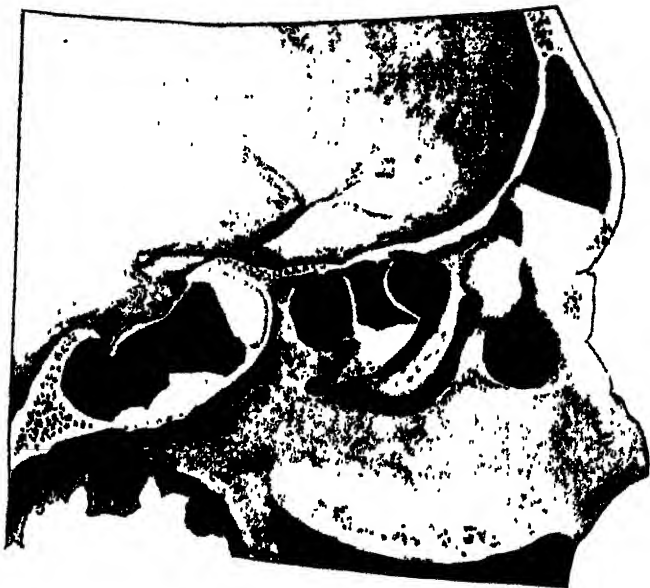


FIG. 45.—THE ETHMOIDAL CELLS AND ADJACENT SINUSES.

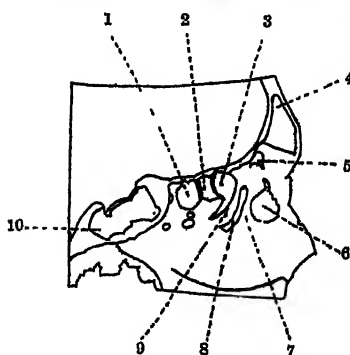


FIG. 45A.

- 1 and 2. Posterior ethmoidal cells.
- 3. Anterior ethmoidal cells.
- 4 and 5. Frontal sinus.
- 6. Agger cell.

- 7. Unciform process.
- 8. Hiatus semilunaris.
- 9. Bulla.
- 10. Sphenoidal sinus.



FIG. 48.—THE SEPTUM NASI.

The part coloured black represents the portion which should generally be removed in the operation of submucous resection of the septum.

Red = Perpendicular plate of the ethmoid.
 Blue = Quadrilateral cartilage of the nose.
 Yellow = Vomer.
 Green = Palate.

crest of the superior maxilla, and it is received into a groove on the superior edge of the vomer, whilst a thin band of it extends backwards between the vomer and the perpendicular plate of the ethmoid. It represents developmentally the anterior extremity of the primordial cranium. Antero-superiorly it is firmly attached to the nasal bones at their point of junction, and below this with the superior lateral or triangular cartilages of the nose. Below, again, it is loosely in contact with the lower lateral cartilages, which, one must remember, are of a flattened horseshoe shape, the concavity being directed backwards and outwards, the alæ themselves containing no cartilage.

The tubercle of the septum is a localised thickening of the latter, due principally to an accumulation of glands, and situated at its anterior-superior part, about opposite the anterior extremity of the middle turbinate.

The nose has highly important functions to perform; besides warming, moistening, and purifying the currents of air passing through it, microbes disappearing when placed on the healthy mucous membrane, it, together with the accessory sinuses, acts as a resonator, assisting in voice production, and is, of course, the organ of smell and partly of what is commonly called taste. The vestibule of the nose is lined with squamous epithelium, whilst the general cavity, together with the sinuses and cells which open into it, with ciliated epithelium, the movements of the cilia being such as to tend to drive mucus into the post-nasal space. A small area in the posterior-superior part of the nasal cavity, corresponding to the superior turbinate and adjacent part of the nasal septum, is covered with yellowish mucous membrane, lined with columnar, non-ciliated, and spindle cells, composing the olfactory epithelium.

For testing the direction taken by currents of air passing through the nose, on expiration and inspiration, models have been made of the interior of this organ, and tobacco-smoke drawn through to imitate inspiration and blown back for ex-

piration. The experiments tend to show that during inspiration the air passes up to the anterior end of the middle turbinate, where some of it goes along, hugging this body, whilst another portion curls down round the inferior turbinate; and a small quantity passes up into the olfactory cleft and sphenoidal sinus. On expiration the blast divides into three chief divisions, one passing through the inferior meatus, one to the middle and one to the superior, and a little going up into the olfactory cleft.

EXAMINATION.

The patient being in the sitting position, with the head erect, the light and mirror being arranged as for laryngo-



FIG. 47.—INTRODUCTION OF THE NASAL SPECULUM.

scopy, and any abnormality in the shape, colour, or consistency of the external nose having been duly noted, the tip of the organ is tilted up by the surgeon and the vestibule examined. Except in cases where much hair is present, this requires no instrument except for the examination of the anterior angle, a part sometimes affected with painful

cracks, and for the examination of which a very small mirror of the laryngeal type is required. Having examined the vestibule, a speculum should be introduced, and Thudicum's,

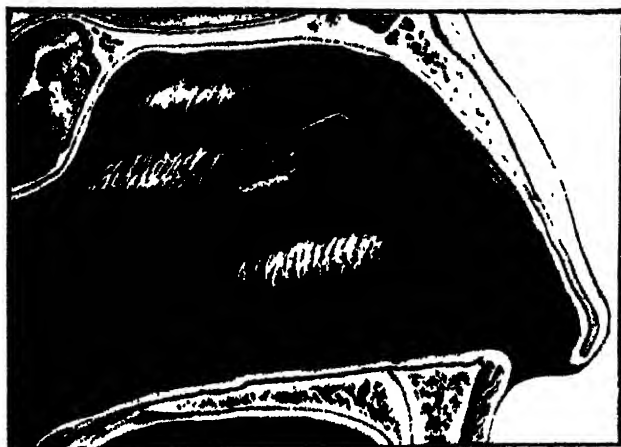


FIG. 48.—THE OUTER WALL OF THE LEFT NASAL FOSSA; THE MIDDLE TURBINATE HAS BEEN PARTLY REMOVED.

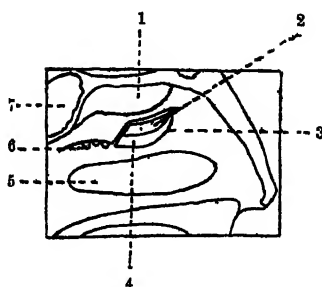


FIG. 48A.

- | | |
|------------------------|--|
| 1. Superior turbinate. | 5. Inferior turbinate. |
| 2. Bulla. | 6. Posterior openings of maxillary antrum. |
| 3. Unciform process. | 7. Sphenoidal sinus. |
| 4. Hiatus semilunaris. | |

shaped somewhat like a small pair of sugar-tongs, is a useful form. This exposes to view a rounded red body,—the inferior turbinate,—taking origin from the outer wall. This extends horizontally backwards, and curling over so as to

form a convex superior and internal surface exposed, and concave inferior surface concealed from view. Not only do these bodies vary actually in size, but also the same body, owing to its containing much vascular erectile tissue, varies greatly at different times, so that a view of the deeper portion of the nose may or may not be cut off by it. Should it be so swollen as to obstruct the view, a little 4 per cent. cocaine solution applied by means of a swab will reduce its size if not due to hypertrophy. Thus having, if necessary, cleared the way, we tilt back the head, and another reddish-looking body may come into view higher up, namely, the anterior portion of the middle turbinate body (Fig. 26, p. 10). This may be rounded or more or less flattened from side to side, hanging down into the cavity of the nose from its attachment above, and externally and beneath it, that is, to its outer side, lies concealed a semilunar recess with a rounded prominence behind and a sickle-shaped process below it. The recess is termed the hiatus semilunaris, and it leads into a passage termed the infundibulum, into which the fronto-nasal duct opens at times; the rounded prominence is the ethmoidal bulla, which corresponds to an anterior-ethmoidal cell, and the sickle-shaped process the uncinate process of the ethmoid. If the middle turbinate is normal it overlaps, and very little is to be seen of the aforesaid parts, but into this hiatus not only the frontal sinus, but the anterior-ethmoidal cells and maxillary antrum, commonly open; they may also open directly into the meatus. The mucous membrane of the middle turbinate may be much swollen, causing obstruction, or it may be distended by a cell sometimes of considerable dimensions.

Turning now to the inner side, we find the septum, bony posteriorly and cartilaginous antero-superiorly, and separating it from the middle turbinate is the sulcus olfactorius, a space through which odours reach the end organ of the olfactory nerve. At its antero-superior part is seen the tubercle of the septum. Deviations of the septum and spurs

are exceedingly common, and do not necessarily require any operative interference, especially if a free air-way is present through the nose. Examination by means of a probe is very useful, particularly in testing the mobility and consistency of the various parts, especially the middle turbinal. The floor is smooth and boat-shaped, *i.e.*, concave from before backwards and from side to side. In favourable cases, where the nasal cavity is wide and unobstructed and the illumination good, it may be possible to get a view of the posterior wall of the naso-pharynx, which is made more obvious by getting the patient to swallow; also, if the inferior turbinate body be small, the Eustachian orifice on the same side may be seen behind its posterior extremity.

Posterior Rhinoscopy.—This method of examination requires considerable practice, but perseverance will be rewarded. The patient having been told to open his mouth, and at the same time breathe steadily through the nose, the centre of the tongue is pressed down by means of a reliable spatula; it is surprising how much pressure the tongue will stand, but it must not be made too far back, otherwise retching is almost sure to arise. Having got over the first difficulties, the tongue being held down, the patient having his mouth well opened, and breathing steadily through the nose, a small laryngoscopical mirror is warmed and carefully placed just below and behind the uvula. It is better that the mirror should not touch anything, but especially the base of the tongue. The handle may be supported by the cheek at the angle of the mouth, and the mirror itself makes an angle of about 45° with the horizon, the shining surface pointing forwards and upwards. If difficulties arise, a little 4 per cent. cocaine may be sprayed into the pharynx; but this does not assist posterior rhinoscopy as much as it does some other examinations; difficult cases may often be conquered by frequent examination.

One should now see in the mirror, in the middle line, the

image of the posterior border of the septum nasi, thin, in the centre thickened at the upper part, and this may be described as the key to the position. Having made certain of this, by tilting the mirror in different directions different parts come into view. On either side of the septum are the openings of the posterior choanæ, and at the lower part of these, on either side, the greyish posterior extremity of the inferior turbinate, its lower portion being generally cut off from view by the palate. Above this lies the posterior extremity of the middle turbinate, more flattened from side to side, and the insignificant superior turbinate above that again, each of these having its respective meatus beneath it. Should any considerable quantity of adenoids be present, the view of the posterior margin of the septum in its upper part, and of the superior meatus, may be cut off. On making the mirror more horizontal, the upper part or vault of the pharyngeal wall will come into view, and, on the other hand, on making it more nearly vertical, the back of the palate and the uvula appear, and again, on tilting it sideways, the orifice of the corresponding Eustachian tube is seen with its well-marked posterior lip, and the depression behind it called the fossa of Rosenmüller. Besides the ordinary laryngeal mirror, another is made in which, by pulling a trigger, the mirror can be tilted to different angles. This, however, takes up rather more room in the throat, is more difficult to clean, and more liable to get out of order, and therefore cannot be recommended. The various contrivances for posterior rhinoscopy, made on the principle of the cystoscope, in which the light is a lamp in the head of the instrument, though useful in special cases, for general use do not come up to the above simple method. In those cases (and they are rare) in which no sort of view can be obtained with the mirror, owing to the soft palate and uvula cutting it off, these may be held forward either by a palate hook or a piece of rubber drainage tube passed through the nose and drawn out of the mouth and tied



FIG. 49.—POSTERIOR RHINOSCOPY.

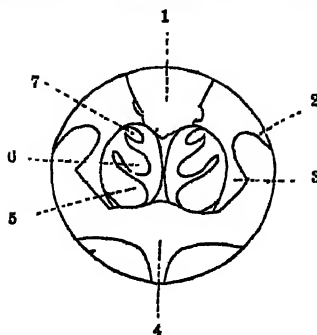


FIG. 49A.

1. Remains of adenoids.
2. Fossa of Rosenmuller.
3. Eustachian orifice.
4. Soft palate.
5. Inferior turbinate.

6. Middle turbinate.
7. Superior turbinate.

Vertically in the middle line is the septum nasi.

over the upper lip. Although some young children will tolerate the examination with the mirror, a great number will not, and when it is imperative to examine these, and also in the case of those older persons who are not tolerant, the digital method should be employed. This, though not an agreeable proceeding for the patient, will not be so bad if the surgeon is quick, light of touch, and has a thin forefinger. With adults, the patient is seated, and should be told what it is proposed to do, and a gag may be placed in the mouth, which is sufficiently opened to easily admit the forefinger. To bring down the soft palate, the patient is told to breathe steadily through the nose. The surgeon, standing on the patient's right, should steady the latter's head with his left arm, and quickly passes his right forefinger back to the posterior pharyngeal wall, and up behind the palate before the latter has time to be drawn up—if he is too late, and this has already occurred, he must separate it gently from the pharyngeal wall. Thus, having reached the post-nasal space, he sweeps the tip of his finger round, and informs himself as to the presence of abnormalities, such as a post-nasal growth, or polypus, enlargement of the posterior end of the turbinate, or disease of the posterior border of the septum (see p. 14).

AFFECTIONS OF THE VESTIBULE.

Almost any skin disease may attack the vestibule, which is lined with squamous epithelium, and is provided with numerous hair follicles, but the commonest trouble here is eczema, with a tendency to cracks and furunculosis.

The *treatment* consists in the cure of any nasal catarrh present: Application of white precipitate or dilute nitrate of mercury ointment, and painting any fissures with nitrate of silver solution, 1 drm. to the ounce, or pure carbolic acid. If the tip of the nose is much inflamed, calamine or lead lotion should be applied.

Atresia of the nasal orifices is very rare, but may be bilateral or unilateral, and either the anterior or posterior nares may be closed. When situated anteriorly, it may be congenital, or due to a disease, such as syphilis. When posteriorly, it is practically always congenital, and it may be bony or membranous.

Treatment.—If necessary, when anterior, a plastic operation must be planned; whereas, when posterior, the burr, knife and punch forceps will remove the obstruction.

Collapse of the Alæ Nasi.—This occurs particularly in cases where developmentally weak alæ are associated with nasal or post-nasal obstruction, the result being that when the said obstruction has been removed, the patient still has difficulty in breathing through the nose, which, however, is at once relieved by the introduction of a speculum.

Treatment.—If the patient does not wish to submit to operation for this trouble, the alæ may be supported and the nasal orifice kept open by means of a rubber tube or special instrument made for the purpose and worn constantly. Several operations, however, have been devised for relieving the obstruction. One of these is to remove part of the inner wall at the entrance, and so give more room; another is to keep the nares open, and prevent collapse mechanically by inserting a small flap by means of a plastic operation into the anterior angle of the nares.

AFFECTIONS OF THE GENERAL CAVITY OF THE NOSE.

Acute Rhinitis, in its commonest form usually called a cold in the head, is of everyday occurrence, is no doubt contagious, and has been ascribed to various microbes, the principal found being the *Pneumococcus catarrhalis*, and influenza bacillus, whose guilt, however, from an etiological point of view, cannot be said to have been proved in all cases. An attack apparently protects for a short time

only. It is well marked in the early stage of measles and some forms of influenza. It seems sometimes to be brought on by dust, certain drugs, specially iodide of potassium, gouty conditions, and also spreading from other parts, such as the throat. The symptoms are a feeling of fulness in the head, quickly followed by attacks of sneezing, which partly relieve the fulness; this, however, quickly returns. There is but little actual pain, as a rule, but some headache is common, and the nose feels blocked and swollen, and the patient shivery and uncomfortable. Watery fluid soon runs freely from the nasal membrane, so that the anterior nares become quite sore from the constant blowing and running. The senses of smell and taste are much interfered with; the eyes participate to some extent, and a certain amount of conjunctivitis is present; also hearing may be dulled owing to blocking of the Eustachian tube. As time goes on, the discharge gets less, and changes in character, getting thickened and more opaque, and dries up within a week or ten days.

Examination shows, if seen early enough, an intensely red, dry, glazed membrane, soon, however, to become wet from the outpouring of a clear mucus, and, later on, is seen to be more or less plastered over with tenacious, thickened muco-pus or strings of mucus passing across from one side to the other.

Treatment.—In its slightest form, treatment is hardly necessary, but smoking must be stopped. In severe cases, however, to limit the duration and severity of acute catarrh, rest is of primary importance in a well-warmed and well-ventilated room. Only a very light diet should be taken, and perspiration promoted by hot baths at bedtime. As regards medicine, Dover's powder, quinine, with aromatic spirits of ammonia and aspirin, have been found efficacious. Vaccines have apparently cured some cases, and produced periods of immunity, but the evidence is conflicting as to their utility; it is well in any case to have a culture made.

Locally, the doctor may give relief by spraying the nasal membrane with 2 per cent. cocaine solution, whilst the patient may use a spray of menthol, coryphin, and cinnamon dissolved in liquid paraffin, which helps to keep down the congestion and tends to prevent the exits from the various sinuses leading into the nose from getting blocked. Later on, when the stage of inspissated discharge is reached, a warm nasal wash (p. 248), of sodium bicarbonate and baborate twice a day gives great relief.

Hay Fever may be looked upon as an intermediate affection between acute rhinitis and pure nasal neuroses. The patients are chiefly young adults of the middle and upper class. The predisposing cause seems to be the neurotic temperament, often hereditary, intranasal abnormalities, such as spurs and deviated septa, a hyperæsthetic condition of certain areas of the mucous membrane, the gouty diathesis, and some atmospheric conditions; whilst the exciting cause is most commonly pollen from grass, but also dust and various odours proceeding from animals and plants may produce the symptoms.

The attacks generally begin in the spring or autumn, and commence with symptoms of great irritation, the eyelids becoming swollen and the eyes suffused. The nose feels uncomfortable and blocked up, and very soon a free watery discharge is set up. Headache may be troublesome. Paroxysms of sneezing occur. The attacks, which may last for hours, or, with some intermittence, for days, are apt to make the patient very weak and depressed, and all social functions are very much interfered with during the period at which the attacks are rampant.

On *examination*, nothing very definitely pathognomonic is to be seen, the mucous membrane being simply swollen and congested, or, in some cases, even pale and oedematous looking.

The *prognosis* must be guarded, and it is unwise to promise anything like a cure; relief can often be given and

life made more tolerable, but it is unfortunately common to meet sufferers who have been wandering about from one doctor to another without getting much benefit, and who seem to have come to the conclusion that the best thing to do is "to grin and bear it."

Treatment.—When advice is sought some time previous to the period at which an attack is expected, with a view to its prevention, the question of a sea-voyage, or, failing this, residence at the seaside or somewhere as far as possible away from pollen must be considered, the general health improved, and nerve tonics, such as arsenic, may be administered with advantage in some cases. The urine should be examined, and any gouty tendencies treated. The nose must be carefully examined with a probe, and the presence of any abnormalities noted, and also any hypersensitive areas which when lightly touched produce sneezing and lachrymation. These sensitive spots should be cauterised with the galvanocautery (see p. 112). If this does not seem effectual, much benefit is sometimes derived by removing spurs and portions of hypertrophied turbinates or correcting septal deviations. In other cases, the results, as far as the prevention of an attack is concerned, are disappointing. During an attack a weak spray of adrenalin solution, 1 in 10,000, will give marked relief, and so will cocaine, 4 grains to the ounce; but it is highly undesirable that the patient should get into the habit of using these drugs, particularly cocaine. Less potent palliative remedies are sprays, containing menthol, coryphin, and camphor, 1 to 10 grains dissolved in 1 ounce of liquid paraffin. Pollen vaccine and polantin, a hay-fever serum, have given relief in some cases. A somewhat heroic remedy, which gives severe pain but is also said to be of great benefit, is spraying the nose with a strong solution of biniodide of mercury, a powerful antiseptic.

Chronic Rhinitis.—Under this heading three forms may be described: the catarrhal form, often the sequel of repeated

attacks of acute rhinitis, in which the patient complains that the nose is always running, many handkerchiefs having to be used, the anterior nasal apertures consequently becoming sore, and some portion of the discharge passing backwards into the post-nasal space gives annoyance by necessitating sniffing, hawking and clearing efforts. The nose is sometimes free and sometimes blocked, and this stoppage frequently changes from one side to the other, so that one gets an intermittent alternating stenosis, the dependent side in sleeping being generally the one blocked. The nasal passages may be patent during the day but closed at night.

On examination of a simple case very little is to be seen but a wet, congested, or at times anæmic mucous membrane. Sometimes an impression may be seen on the septum, made by a swollen inferior turbinate, which, however, has receded, and when the examination is made is no longer in contact. Also strings of sticky mucus may frequently be observed crossing from the turbinate to the septum.

Treatment.—Careful inquiry must be made with a view to correcting bad habits, with regard to eating, smoking, and drinking, and medicines ordered to meet any obvious digestive disturbance present. As regards local treatment, in some cases warm alkaline washes (p. 248), seem to give the best results. These should be sprayed in the form of a coarse spray; a douche should not be used. In other cases paint, consisting of dilute nitrate of mercury ointment, 1 part with 3 parts of liquid paraffin, applied with a small swab or brush to the nasal mucous membrane twice a day, gives marked relief. Considerable benefit may often be obtained by the hot sponging of the face and neck, followed by cold, every night and morning.

Hypertrophic Rhinitis. — This form may apparently result from repeated attacks of acute catarrh, or from the prolonged action of dust or damp or any cause tending to render the mucous membrane unhealthy and the nasal

ventilation bad, such as deflection of the septum, adenoids and sinus suppurative disease. Very often digestive troubles are present in these cases, but it is not easy to say whether this is the cause or the effect of the trouble.

On examination the mucous membrane is seen to be hypertrophied and often congested, though at other times it may be pale and œdematous. Any or every part may be affected, fleshy masses being produced, but the region most commonly and notably liable to suffer is the inferior turbinate body. The anterior part of this structure may be smooth, and look like a cherry, or may be lobulated. It may extend over to and touch the septum; the body or central part is not so frequently affected as the ends, but may be enlarged both on its convex and concave aspects, in which case large, lobulated masses can sometimes be demonstrated lying beneath it by means of a probe. The posterior ends are commonly enlarged, the surface being irregular, producing the well-known moriform or mulberry-like appearance as seen in the mirror on making a posterior rhinoscopic examination. The middle turbinate may be affected, but not so often and not so markedly as the inferior, and the same applies to the mucous membrane in the other parts of the nasal cavity. The tubercle of the septum, however, may be a good deal hypertrophied. In examining a case of hypertrophic rhinitis it is desirable that a probe should be used, as it gives us important information as to the presence of œdema and mobility of the swollen tissue, besides indicating the degree of sensitiveness. Also cocaine should be applied, in the form of a weak spray (4 per cent.), or preferably this may be applied with a swab if possible, and enables us to distinguish between vascular congestion, which disappears, and true hyperplasia, which remains.

The symptoms are chiefly those of nasal obstruction, and are often worse at night. The patient states that either he cannot breathe through the nose or only very imperfectly,

and various functions are more or less interfered with; for instance, the voice is changed, and becomes more or less dead; the eye is watery, owing to interference with the escape of tears from the nasal duct; there is some loss of taste and smell, discomfort in swallowing owing to difficulty in breathing through the nose, deafness from interference with the functions of the Eustachian tube, and more or less headache. The pharynx and mouth get dry and unpleasant, and there may be excess of watery secretion from the nose. The patient is often accused of snoring.

Treatment.—The cleansing sprays and washes used in chronic catarrhal rhinitis may first be tried, and in slight cases breathing exercises, but in bad cases something more will be necessary, and this generally takes the form of either cauterisation with the galvano-cautery or operation.

This former method is not suitable for very bad cases, in fact, it may be laid down as a working hypothesis that cases so marked that the inner and outer walls, *i.e.* turbinates and septum, are in contact are not suitable for the cautery, and if it be used adhesions are likely to form, leaving the patient in as bad or a worse plight than before. If, however, the case is one of only moderate severity, it may be used with advantage, as it pins down the hypertrophied mucous membrane and causes contraction. The method employed is as follows: The parts intended to be cauterised should first be cleansed with an alkaline wash (p. 248); this may be well accomplished by means of an ordinary syringe, to which has been attached a small piece of indiarubber tube about an inch and a half in length, or with a coarse spray of the same lotion. This having been done, a freshly made 10 per cent. solution of cocaine hydrochlorate should be applied; there are several methods of doing this—

1. By means of the spray. This is easy and effective, but more is used than is necessary, and parts are cocainised which do not require it for our purpose.

2. A pledget of cotton wool may be soaked in the cocaine solution and placed in the nose in contact with the part affected. An objection to this is that, under the influence of cocaine the parts contract, more space is produced, and the plug is apt to slip out of position and disappear, which may necessitate a tiresome search on the part of the operator and alarms the patient.

3. Another method is to gently rub the cocaine solution into the part affected by means of cotton-wool twisted on to a damped probe; this is repeated once or twice during the waiting period (fifteen minutes), and gives adequate anæsthesia to the parts, and is, I think, the most satisfactory method in most cases. The cautery may now be applied, and the narrow-pointed burner is the most generally useful form. A preliminary test should be made so as to get the platinum point to the right heat, which should be of a cherry-red colour; if only a dull red, it is apt to stick to the parts; on the other hand, if white-hot, it cuts like a knife, and this heat may destroy the burner. The point is now placed in position in the nose, and the current turned on. If it be drawn along the hypertrophied portion so as to produce one or two linear scarifications, a good result will generally be obtained. In other more localised hypertrophies puncture with the point of the cautery in two or three places is indicated. The cautery should be withdrawn a little, before the electric current is turned off, in order to prevent sticking. But little after-treatment is necessary. Menthol dissolved in liquid paraffin (2 per cent.) is sprayed into the nose three times a day with a nebuliser, and the patient kept under observation for a few days; and he must particularly avoid exposure to any cases of contagious disease, *e.g.* scarlet fever, as experience has shown marked susceptibility under these conditions. If sufficient space is not obtained on the separation of the scabs which form, the process may be repeated.

SEVERE CASES UNSUITED FOR THE CAUTERY AND REQUIRING OPERATION.

The part to be removed and the vestibule are painted with tincture of iodine half an hour before the operation, and immediately before the introduction of anæsthesia the nose should be washed out with alkaline lotion (p. 249). In most cases local anæsthesia will be quite sufficient, and

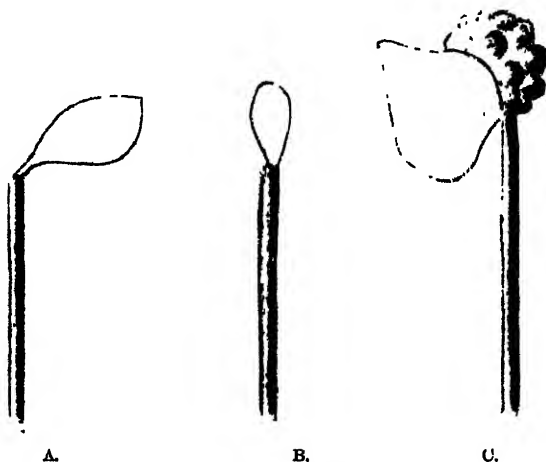


FIG. 50.—NASAL SNARE.

- A. Wire protruded and bent over. B. Wire retracted.
C. Seizing moriform hypertrophy.

his should be 20 per cent. cocaine solution, to which an equal quantity of adrenalin solution, 1 in 1000, has been added, and which may be applied as for cauterisation.

For the hypertrophied anterior end of the inferior turbinate the best operation is to separate the hypertrophied part from its attachment to the outer wall with the scissors, then removing the detached portion with a snare. If the middle part be affected, this may be reduced by means of such forceps, such as Grünwald's or by Luc's. The enlarged posterior end is not quite so easy, and the shrinkage caused when cocaine is used makes it increasingly

difficult. It may be removed by Luc's forceps or the snare, the latter having the advantage of causing less hæmorrhage. In some cases the loop of the snare can be made to take a grip of the posterior end, particularly if a simple device be used—that is, having protruded the loop, say about an inch, it is given a bend and then partly withdrawn. If now it be placed in position in the nose and gradually protruded, it will curl over the projecting posterior end, which, on tightening up the wire, will be securely seized. If difficulty be found, it may be necessary to invoke the aid of the forefinger of the hand which is not holding the snare, by passing it through the patient's mouth into the post-nasal space and pressing the loop of wire down over the swollen end of the turbinate. This is so soft that without practice it may be almost imperceptible to the touch. Unfortunately, this proceeding is decidedly unpleasant for the patient, and a general anæsthetic may be necessary—ethyl chloride or nitrous oxide gas being sufficient if the operator is an expert: a gag, of course, will be necessary. The operator, on tightening up the loop, feels it gripping the hypertrophy, which comes away with the snare as he withdraws it from the nose. The middle turbinate is sometimes much enlarged, owing to the presence of a cystic condition in its interior. Its anterior extremity, when causing obstruction, may be removed by making an oblique incision through its anterior superior angle by snipping it with the scissors and inserting the snare wire in the incision, and slowly tightening up, or by means of Luc's forceps in many cases. Some surgeons prefer reflecting the hypertrophied mucous membrane of the inferior turbinate, and perform a submucous turbinectomy.

After-treatment.—When hæmorrhage rapidly ceases very little is required, or a few days' rest in a well-ventilated room, not necessarily in bed, is advisable. A loose plug* of cotton-wool inserted in the anterior nares helps to keep the wound clean by filtering off any dust from the air inspired.

In some cases the wound remains dry, and heals, as it were, under a scab, and to these the motto, "Leave well alone," is highly applicable, but if discharge is present, an alkaline antiseptic spray (p. 249) is useful. Hæmorrhage may be troublesome after any of these operations, especially the removal of the posterior end of the inferior turbinate, and therefore the question of packing the nose will have to be considered. Unfortunately, packing is in itself undesirable; it damages the delicate ciliated epithelium, interferes with drainage, facilitates septic changes, often produces irritation, restlessness, sleeplessness, and rise of temperature, and therefore should be reserved for bad cases and those which are not within easy reach of skilled assistance. In most instances if the patient is kept at rest, cold applications made to the nose externally, and he be told to breathe steadily through it if possible, but not to blow it, the hæmorrhage will cease of itself. Sometimes cessation of hæmorrhage may be brought about by making the patient sit up. If it continues to bleed so freely as to cause alarm, plugging must be resorted to, and the nose packed with strips of gauze soaked in adrenalin solution, 1 in 2000. These, however, must not be kept in more than twenty-four hours as a maximum. Plugs used in the posterior nasal region become septic much more rapidly than those used in the anterior parts.

A word or two of warning is necessary as regards operations and cauterisation in hypertrophic rhinitis. This affection is sometimes followed by marked atrophy, so that it is better far to remove too little than too much.

Atrophic Rhinitis (Simplex).—Nomenclature here is, unfortunately, at fault, and one must be careful not to confuse this complaint with foetid atrophic rhinitis or ozæna, which is an entirely different disease. Atrophic rhinitis may possibly be the result of a primary atrophy, or be secondary to hypertrophic rhinitis, which may, unfortunately, not infrequently be the result apparently of too extensive intra-

nasal surgery or cauterisation; in any case, nutrition of both bone and mucous membrane seem to suffer, and atrophy ensues. The patient is often addicted to alcohol or suffers markedly from dyspepsia, and the throat also is apt to be affected. The membrane is dry, pale, and thin, and may be marked by minute excoriations, which are apt to give rise to slight hæmorrhage. What secretion there is consists of sticky inspissated mucus, but no particular odour is associated with it. The patient's nose feels dry, stiff, and uncomfortable and stuffy, notwithstanding the fact that there is a free current of air through it. A certain amount of loss of taste, smell, and hearing are commonly associated with it, and loss of voice also.

Treatment.—This is not very satisfactory, but the patient may be made more comfortable by means of an alkaline spray (p. 249) and an atomiser of liquid paraffin. Many of these patients are debilitated and out of health generally; their tobacco and alcohol must be strictly limited or forbidden, the diet carefully arranged, the bowels regulated, and a better tone given, if possible, to the system by tonics and change of air.

Fetid Atrophic Rhinitis, or Ozæna.—This disease begins in early life, and is particularly common in young women. It has been attributed to the exanthemata, especially measles and syphilis, the *Bacillus fetidus*, and other organisms, and has been believed by at least one authority to be always associated with sinus suppuration. In typical cases the nose is a snub one, and looks sunken in the face, the bridge and alæ being wide, and the nostrils directed forwards and downwards; but this is not always the case, and there may be nothing external to act as a guide. It is generally bilateral, but sometimes unilateral. Pathologically, one finds atrophy of the tissues, with fatty degeneration and fibrosis, also replacement of the normal ciliated epithelium by squamous.

The chief and most troublesome symptom is that the patient is haunted by a peculiar and highly offensive odour, which, when once smelt, is not likely to be forgotten; the

sufferer, however, whose sense of smell is very defective, does not, as a rule, herself perceive it, and in this respect it is just the opposite to the odour of chronic sinus suppuration, which is usually more obvious to the patient than to others. Pain is not a marked feature, though headache and neuralgic pains about the root of the nose are not uncommon. Intermittent nasal obstruction is troublesome, the patient being unable to satisfactorily clear the nose, owing to the wide bore of the nasal meatuses; crusts, however, are detached from time to time and either swallowed or got rid of by snuffing, hawking, or blowing the nose. Stomach derangement is common with these patients, and not only are taste and smell affected, but some dulness of hearing and hoarseness are not unusually met with.

The offensive odour varies in intensity very much at different periods; it always seems accentuated in the atmosphere of warm, ill-ventilated rooms, and is very marked about the menstrual period, but diminishes with advancing age.

On examination, after noticing the absence of hair from the vestibule, we are struck at once in a typical case by the spacious character of the nasal fossæ and the small size of the turbinate bodies, especially the inferior, whilst plastered over the walls and extending into the post-nasal space are greenish yellow crusts and masses of secretion, partly dry and partly moist and different in consistency from true pus. The discharge is somewhat adherent and difficult to remove in places, and not only may it extend into the sinuses and pharynx, but also the larynx and trachea, and it has the above-mentioned abominable odour. On removal of the secretion the mucous membrane beneath has a shrunken glazed appearance, but ulceration is rare. These crusts generally prevent a full view of the nasal cavities, but when they have been removed, owing to the atrophy of the turbinates, structures not usually easy to see will be made manifest, namely, below the Eustachian orifice and upper

surface of the soft palate and posterior wall of the pharynx, all more noticeable on getting the patient to swallow; whilst, if the middle turbinate be much atrophied, one can see above, the uncinatè process, the bulla, and high up and far back the opening into the sphenoidal sinus. The diagnosis may be made in almost all cases by the odour and the crusts. Tertiary syphilitic disease, which it probably most resembles, has a different odour, and necrosis and ulceration are common in that complaint; and the same may be said of tubercular disease, whilst the absence of true pus helps us to distinguish it from sinus suppuration. The view held that this disease, namely, ozæna, is always associated with and depends on the latter, is not supported by the great majority of observers.

Treatment.—We can do much to alleviate, in this complaint, but it is not advisable to hold out hopes of a complete cure, though with time the symptoms abate very much. The first thing to do is to get the nasal cavities free from the offensive crusts; these may be loosened by means of a spray of peroxide of hydrogen (6 vols.), and the nose afterwards douched with a solution consisting of 3 grains of sodium chloride to the ounce of warm boiled water; such crusts as still adhere may be removed with forceps or cotton-wool swabs. Having got the nose clear, a weak antiseptic solution, such as formalin,¹ 1 in 1000, or lysoform, 1 in 500, may be sprayed in, or menthol or coryphin dissolved in liquid paraffin. The patient may now herself repeat the washing-out process once a day, and so keep the cavities fairly clear of the offensive secretion; but the surgeon must examine her nose from time to time and see that this is done properly, and assist in the cleansing process if necessary. She should also be shown how to close one side of the nose by external pressure of the finger and so increase the expulsive effect of the expiratory blast when blowing that organ. Marked improve-

¹ The vapour of formalin is exceedingly pungent to the nasal mucous membrane, so caution must be used.

ment may also be obtained by packing the nose with ribbon gauze for from twelve to twenty-four hours, the membrane looking much more healthy after its removal; but, unfortunately, this is only temporary. It has been stated that cures have been obtained by the injection of diphtheria antitoxin, but I have never seen one. Seeing that getting rid of the discharge by blowing the nose is made difficult, owing to the wide bore of the cavities reducing the expulsive force of the expiratory blast, it has been suggested that the calibre should be reduced by the injections of solid paraffin beneath the mucous membrane, and this has been so far successful as to lessen the stagnation of secretion and consequent formation of offensive masses.

Rhinitis Caseosa.—This rare disease is chronic, and its



FIG. 51.—RHINITIS CASEOSA.

tiology obscure; it is characterised by the formation of a

collection of inspissated pus in the interior of the nose, generally limited to one side. There is nasal obstruction and some headache, and an oozing of watery fluid occasionally tinged with blood and pus. In a fairly typical case reported by the author in 1904, in a boy aged 10, the nose was materially broader than normal. The sense of smell was abolished, and taste defective. He always kept his mouth open, and the nose appeared quite stopped up. At the operation the septum was found to be perforated, and a very free opening existed into the left antrum: large quantities of highly offensive caseous material were removed, and a few small polypi, by means of a curette; hæmorrhage was slight. Cultures were made from the caseous material, and produced *B. diphtheriæ* (Klebs-Loeffler) *Staphylococcus pyogenes aureus*, and a *Micrococcus albus*. Recovery was uneventful, and there was no recurrence.

Fibrinous Rhinitis.—This is a chronic or subacute affection. It owes its importance to its connection with true diphtheria—that is to say, that the Klebs-Loeffler bacillus can nearly always be found in the nasal discharge. These patients may be a centre for infection, and may occasionally give rise to an outbreak of true diphtheria; therefore the obvious necessity of isolating them. The patient, almost invariably a child, complains at first of what appears to be a cold, with a stuffy nose. Gradually the watery discharge becomes more purulent, and there may be epistaxis. One or both sides may be affected. The symptoms somewhat resemble those of a foreign body in the nose, but the diagnosis is made clear by the discovery of membrane and the *B. diphtheriæ*. The vestibule and upper lip become sore and excoriated; pieces of membrane may be discharged, or be seen lying in the nasal cavity, but are never so adherent as in true nasal diphtheria. The constitutional disturbance is practically nil, and if the nose be well syringed with an antiseptic alkaline lotion (p. 248) night and morning, and dilute nitrate of mercury

ointment applied, the disease very quickly disappears. The patient must not be dismissed, however, till all the Klebs-Loeffler bacilli have disappeared from the discharge.

The prognosis is very good. No paralytic sequelæ follow this disease, as they do in the case of true diphtheria. Anti-toxin is not required.

Purulent Rhinitis.—This occurs in connection with the infectious fevers, especially measles, scarlet fever, and diphtheria. Also cases occur in infants, due to gonorrhœa in the mother, and occasionally in adults by inoculation by means of the hands. Glanders must be remembered also as a rare cause of purulent rhinitis, and so must the presence of a foreign body. The history and a bacteriological examination will help us to arrive at a correct diagnosis as to the cause.

Treatment.—This will vary with the disease, but, speaking generally, will consist in careful cleansing with normal saline or boric acid solution, in addition to whatever the special requirements of the case may be.

Mucous Polypus.—This may be described as a localised œdematous infiltration of the mucous membrane, and is the commonest form of intranasal growth. It may be single, but is more commonly multiple, and may arise secondary to a diseased condition of the bone, generally the ethmoid; others, however, believe that this is not the primary factor, but that the mucous membrane is first of all affected. Probably either may be the case. It is most commonly met with in adult life, though occasionally seen in children, and appears as a grey, softish, semi-translucent, rounded swelling, except where pressure has tended to flatten it. The lower portions of the polypi are liable to become fleshy-looking and opaque from friction and exposure, and this portion loses its normal ciliated epithelium and becomes covered with squamous cells. The growths vary largely in size, from a pea upwards to the maximum capacity of the nasal cavities, in which large numbers may

be closely packed, in rare cases causing partial absorption and separation of the nasal bones. The commonest seat of origin is the middle turbinate and its immediate neighbourhood, but they may occasionally arise from any part and are found also in the accessory sinuses. The chief symptoms are those of nasal obstruction, the blocking up of the nasal passages, which is accentuated by damp, and, though variable,



FIG 52.—POLYPUS NASI, ALMOST PROTRUDING FROM THE VESTIBULE.

tends to very gradually become worse and worse, till total occlusion may take place, making it necessary for the patient to breathe entirely through the mouth. Another troublesome and fairly constant symptom is a watery discharge from the nose, which makes the upper lip sore, and is a source of annoyance, particularly when the patient's head is bent forward, as in writing. Sense of smell and taste are greatly interfered with. Pain is generally absent, though headache is occasionally complained of. If, as is frequently the case,

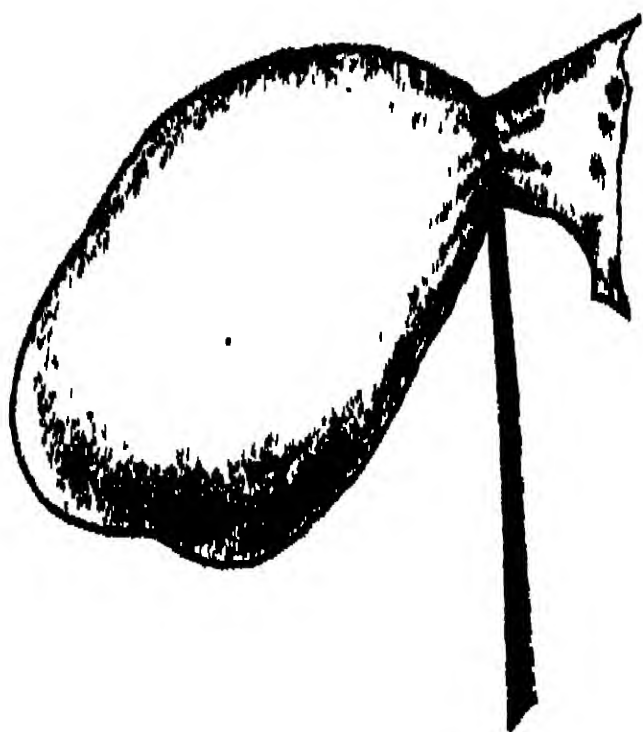


FIG. 53.—POLYPUS NASI WITH PORTION
OF BONE ATTACHED: REMOVED BY
MEANS OF THE SNARE.

the polypi are associated with sinus suppuration, pus will be mixed with the watery discharge. The association of bronchial asthma with nasal polypi is often well marked, and I have reported a case in which typical asthmatic breathing came on at the identical moment that a curetting operation was commenced in a bad case of nasal polypi, the patient being lightly under a general anæsthetic at the time. A probe helps one considerably here towards the diagnosis, also the grey colour, glistening appearance, the soft consistency and mobility all pointing to the nature of the growth. Nasal polypi do not shrink on the application of cocaine, so a spray of this drug is very useful in enabling us to discover small ones situated high up or far back in the nose. A posterior rhinoscopic examination should always be made in these cases, as some nasal polypi are only visible by that means. In old people, particularly where polypi have quickly recurred after removal, the question of malignancy must not be lost sight of, and a microscopical examination should always be made, as apparently innocent polypi sometimes turn out to have a carcinomatous basis.

Treatment.—This is by removal. In simple cases, after cocainisation with 10 per cent. cocaine by means of a spray,—for if applied on a pledget of wool this latter is apt to get lost,—the polypi are best removed with a snare. The wire loop is gently pushed or wriggled over the growth till it reaches its base. It is then tightened up till the pedicle is felt to be firmly gripped, when a sudden pull brings the polypus away from its base, more completely than if cut through by the wire, and also a piece of diseased bone will sometimes come away with it. If there is any difficulty in catching the polypus in the wire loop, Luc's forceps should be used. Getting the patient to blow his nose often helps to bring the polypi within more easy reach. Hæmorrhage soon ceases. Several sittings will often be required to clear the nose, as the bleeding prevents a good view, and when examined after

the interval of a week, other polypi will appear of which one had no previous cognizance. Having removed these as thoroughly as possible with a snare and forceps, one may finally apply, by means of a small swab, nitrate of silver solution, 20 grains to the ounce, or chromic acid, 15 grains to the ounce, or a spray of rectified spirits of wine, which seems to shrivel up the remains of the polypi, and check recurrence. The patient must be warned, however, that recurrence will probably take place, and should be advised to come up for inspection at least once or twice a year.

SEVERE CASES, IN WHICH THE POLYPI ARE ASSOCIATED WITH EXTENSIVE BONE DISEASE, AND IF REMOVED ARE RAPIDLY RECURRENT.

These cases, if the patient is in good health and not beyond middle age, may be effectively treated by putting the patient under a general anæsthetic and curetting away the polypi and diseased bone. In doing this, all strokes of the ring knife, or curette, must be made downwards, *i.e.* away from the cribriform plate of the ethmoid. This operation, however, should not be lightly undertaken, as it has a fair number of deaths recorded against it. The cribriform plate of the ethmoid and the orbit are within easy reach of the curette, and no operator without a delicate sense of touch and a good knowledge of anatomy of the parts should ever attempt it, and even after the operation a cure cannot be guaranteed, and recurrence may take place. A black eye and damage to the orbit and its contents also is not uncommon.

Cases associated with Suppurative Diseases of the Sinuses.—The removal of polypi may materially aid in the drainage and cure of the sinus suppuration, but if a special operation is required for the relief of the latter, the polypi can be most effectively dealt with at that time.

Bleeding Polypus, or Anglo-fibroma, is a rather rare and almost invariably solitary tumour, formerly termed bleeding

polypus of the septum, but now known to grow from other parts, *e.g.* the floor of the nose and inferior turbinate; also at one time thought to be malignant, but this appears to be incorrect. The growth on section is found to consist of fibrous tissue with cavernous spaces containing blood.

The patient generally comes complaining of nasal obstruction and troublesome hæmorrhage from one side of the nose. On examination a rounded, more or less pedunculated, red or pinkish tumour, often resembling a small cherry, is seen, taking origin most commonly from the anterior-inferior angle of the septum; the nearer the growth lies to the nasal orifice, the more likely, obviously, is it to suffer from trauma and consequent hæmorrhage. Treatment consists in complete removal, including its base; if merely snared off, recurrence is extremely probable. I find the best plan is to remove the growth with the knife, cutting about a quarter of an inch wide of its point of origin all round, and afterwards to apply the galvano-cautery, which checks the hæmorrhage and also makes recurrence less likely.

Papillomata occasionally occur growing from the vestibule and adjacent parts, and may be snared off and the base cauterised.

MALIGNANT DISEASE.

Malignant Diseases may be either **Sarcoma** or **Carcinoma**.—Probably the latter, which occurs chiefly in old people, is more common. It affects usually the outer wall of the nose, causing gradually increasing nasal obstruction, which is the commonest symptom; and later on hæmorrhage, foetid discharge, and extension to other parts is apt to occur, producing affections of the orbit and its contents, epiphora, and external deformity. Sometimes a case which appears to be one of simple polypus is operated on with the snare, only to return a little later with an easily bleeding, reddish, brittle, offensive mass, which is highly suspicious and almost makes its own diagnosis. Pain is a variable symptom;

tendency to hæmorrhage on the slightest touch of the probe is a very suspicious sign, and accentuates the necessity of microscopical examination and transillumination; secondary glandular enlargement is exceptional.

Sarcoma occurs mostly in young people, and often affects the septum, but sometimes the outer wall; nasal obstruction and deformity are gradually produced. It sometimes has the effect of pushing the eyes outwards and broadening the bridge of the nose, producing a hideous frog-face appearance.

Treatment.—The cases vary very much in malignancy; some being of a low form, such that, intranasal operations with the curette or cautery may be justifiable to give relief and prolong life. The complete removal, however, where it can be accomplished, is obviously the better treatment. Numerous operations have been devised for dealing with growths in this region, and the one selected will be that giving the best access and most suitable to the necessity of the particular case.

Syphilis may attack the nose in its hereditary form in infancy, producing chronic catarrh or snuffles, with a mucopurulent discharge and flattening of the bridge, and is almost always associated with signs of syphilis in other parts of the body. Primary sores are rare, and so are mucous patches, but tertiary lesions are common both in hereditary and the acquired forms of the disease. Any part may be affected, but the septum is the most common seat, both bone and cartilage being attacked. Complaint is seldom made till the gummata break down, nasal obstruction and disagreeable odour being more complained of than pain. On examination, the nose at this period is found to be blocked up with foul-smelling crusts. On removing these, a pus-covered bleeding ulcer is generally seen surrounding a perforation, the colour of the affected parts being a dark red. Sequestræ are common, and deformity is liable to occur, and sinking in of the external parts, which, if the destructive process continues,

may be entirely destroyed. The diagnosis is generally not difficult; tubercle is the most common disease, which may simulate it, but in this affection the parts are much paler and practically always associated with extensive tubercular disease in other parts, *eg.* the lungs. In doubtful cases the Wassermann and von Pirquet's, or subcutaneous, tests should be tried.

In lupus, the small, pink, apple-jelly-like nodules, the dryness, the cicatricial tendency, and perhaps the skin lesions all help to make the diagnosis clear.

Treatment.—Besides the general treatment, special treatment is necessary; this consists in keeping the nose clean with an alkaline antiseptic lotion (p. 249) and an application of chromic acid solution, 1 part in 10, or pure carbolic acid, to the ulcer. The injection of paraffin both warm and cold has been largely used to mask the deformity following tertiary lesions, but has now rather gone out of fashion.

Tubercular Disease.—This may occur rarely, as a primary tumour, but in that case the diagnosis is generally not made until the microscope has been brought into play. The commonest form is ulceration, with granulations affecting the septum. The cartilaginous parts are very soon perforated, whereas the bone in this disease, unlike what occurs in syphilis, is but little affected; other parts, however, may be attacked, but the disease is very generally associated with phthisis.

Treatment.—If the general condition of the patient warrants it, active treatment should be pursued, the parts being curetted or cauterised, or pure lactic acid rubbed into the ulcerated surface.

Lupus not uncommonly attacks the nose both internally and externally, and most commonly selects young women as its victims. The disease or cicatrices left by it are often present in other parts of the body. Its favourite seats intranasally are the inferior part of the septum, which it may

perforate, and the anterior end of the inferior turbinate and adjacent part of the floor of the nose; it takes the form of a very slowly ulcerating infiltration, with little tendency to discharge, and is marked by the formation of small semi-translucent-looking pink nodules, the contrast of which, with the surrounding normal mucous membrane, is well brought out by painting the parts with a little 10 per cent. cocaine solution. The tendency to cicatrisation is a marked feature, and so is the tendency to the formation of crusts. The parts attacked are very slowly destroyed, so that deformity is liable to occur, though the bone, as distinct from the cartilage, is very rarely attacked.

Treatment.—Energetic local treatment gives good results. The patient should be anæsthetised and curetted, or cauterised with a galvano-cautery; either method is effectual. Or a combination of the two may be used. The nose will have to be packed with gauze if the hæmorrhage is troublesome. Cauterisation with a pencil of carbonic acid snow has also been found effectual, and a little pure carbolic acid may be placed on any small, suspicious spots. Salicylic acid ointment, or resorcin ointment, may be usefully employed when the anterior nares are affected. As regards other treatment, when the disease is close to the external orifice of the nose, X-rays or Finsen rays have been found effective, but radium has been disappointing in action, and I have not seen much benefit from tuberculin, though often tried. Unfortunately, one of the most characteristic features of lupus is its tendency to recur, and patients come up with a history of repeated operation.

FOREIGN BODIES.

The introduction of foreign bodies into the nose affords a fine field for the ingenious child, who, finding fascination in the curious amusement of introducing odds and ends into the various orifices of the body, has at times, with mis-

directed skill, managed to stuff large buttons, pencils, tin-soldiers, and numerous other strange articles into the nose, at the same time often, for fear of punishment, maintaining strict secrecy on the subject. The patient, who is almost invariably very young, is generally brought suffering from one-sided nasal obstruction, while a purulent, blood-streaked discharge is complained of, which produces an excoriation of the nasal orifice and upper lip which often at once strikes one's eye. On careful examination the foreign body may generally be located by sight, assisted sometimes by cautious probing or the X-rays.

Treatment.—The treatment lies in removing the foreign body without damaging the nose or dislocating it into the cesophagus, pharynx, or air passages. If the body is obviously near the anterior nares, with a fairly docile child it may generally be removed without an anæsthetic by means of a fine, blunt hook or bent probe. This is passed above and over the body, so as to get behind it, and then is withdrawn, bringing the foreign body with it. If, however, from the irregular shape of the body, the marked tenderness of the parts, or the turbulent nature of the child, one sees trouble ahead, an anæsthetic must be given; but in this event precautions must be taken by means of a finger introduced into the naso-pharynx to prevent the foreign body falling backwards during the manipulations. The blunt hook is by far the most useful instrument, generally speaking, but sometimes forceps have to be employed, and rarely the body must first be divided with cutting forceps before removal. Spraying out the nose for cleansing purposes, when a foreign body is present, is admissible, but syringing with a view to driving it out cannot be recommended.

Various rare conditions come under almost the same category as foreign bodies, namely, *rhinoliths*, or nose stones, which consist of calcareous masses deposited gradually

round a nucleus, consisting of bone, blood clot, inspissated mucus, or the like. These occur mostly in adults, and may have to be crushed before removal. Cocaine is first sprayed into the nose, and facilitates the operation greatly. They are not very hard, and break up without much difficulty.

Living Foreign Bodies.—Different kinds of insects and maggots may be found in the nose, but this is a rare occurrence in this country. Irritation with sneezing and headache are sometimes common at first, and later on ulceration takes place, with discharge of blood and pus.

Treatment consists in the inhalation of chloroform vapour, which is very fatal to insect life, and washing out the nose with a weak solution of formalin, 1 in 4000, or perchloride of mercury, 1 in 4000. Also, an oily spray impedes their movements, so that they may be readily washed out. Fungi occasionally are to be seen growing in the nose, but no great importance has hitherto been attached to them, except as indicating that the mucous membrane is not in a healthy condition. Recently, however, cases have been reported of a painful disease affecting the antrum, in which a material like the inside of a raisin is found associated with a growth of fungus.

RHINORRHOEA.

Rhinorrhœa is the name given to a profuse watery discharge from the nose, which may, however, have two very different origins—

1. Intracranial, the fluid being, in fact, cerebro-spinal. In these cases headache is generally complained of, the symptoms, if any, being those of intracranial disease, the special characteristics of the fluid being—(1) Its specific gravity is 1004–1007, (2) it contains a substance which reduces the copper on boiling with Fehling's solution; (3) it does not stiffen linen on drying, and on heating no coagulation takes place. Also, the flow of the fluid is more or less continuous. No attempt should be made to check the flow, which might lead to intra-

cranial symptoms, and, as a matter of fact, the patients generally die eventually of meningitis.

2. The second origin is from the mucous membrane of the nasal cavities or sinuses. Symptoms are those of a very free but intermittent discharge, often accompanied by sneezing and lachrymation. The fluid, when collected, shows on examination the following characteristics: Fehling's solution is not reduced, the liquid is not very watery, but is more or less viscid, and stiffens linen on drying.

Treatment.—Washing out the nose with saline solution, consisting of sodium chloride, 3 grains to the ounce, is sometimes effectual; if not, the galvano-cautery may be applied to any hypersensitive areas.

ORGANIC AFFECTIONS OF THE NOSE.

Anosmia, *i.e.* loss of smell; **parosmia**, *i.e.* perversion of smell, which generally means **kakosmia**, *i.e.* detection of a bad smell; **hyperosmia**, *i.e.* over-sensitive sense of smell, are all conditions met with in practice, and in a good many cases much difficulty will be found in definitely finding the cause. The history must be carefully gone into as to whether there has been any severe cold or febrile disease, such as influenza. Syphilis should be considered, and the question of accident or degenerative nerve diseases, such as locomotor-ataxy, and the possible presence of a foreign body or dead bone; and, last but by no means least, indications as to the presence of the hysterical diathesis.

On examination, in the first place the smell should be tested with such substances as peppermint, lavender, cinnamon, asafœtida, seeing whether the patient can identify each in turn; afterwards, examination with a nasal speculum, to see if an obstruction is present, such as polypus, or evidence of the retention of pus, such as occurs in sinus disease, and transillumination will often help us there.

Prognosis.—Where there is a definite obstruction, or pus

is found, and the defect has not been present too long, prognosis is good on removal of the suppuration or obstruction, but recovery of the sense of smell is rare after it has been absent a year. Where no cause can be found, or such a condition as post-influenzal neuritis is suspected, a guarded, though not hopeless, prognosis should be given.

Treatment.—This lies in the removal of the cause, and if this is suspected to be hysteria or neurasthenia, nerve tonics, such as valerianate of zinc or arsenic, should be given. In a certain number of these cases, in which the mucous membrane does not look quite healthy, but nothing more definite can be said, spraying with an alkaline spray (p. 249) may cause an improvement, and may be used for a few weeks; but this should not be continued indefinitely.

VASCULAR NEUROSES.

Hay Fever and Rhinorrhoea, already mentioned, may to some extent be put under this heading, but besides these there are others in which an engorgement of blood in the turbinates, especially the inferior, with its well-developed cavernous tissue, produces a temporary nasal obstruction, intermittent, and often alternating, which, to the patient, who may be of the neurotic temperament, is highly irritating, and who complains that first one side and then the other of his nose is stopped up. There is also not infrequently a dyspeptic or neurasthenic element present, and there can be no doubt but that the condition of the sexual organs has a bearing on these cases, though the exact relationship has not been worked out.

Treatment.—This should first be general, consisting of plenty of fresh air and exercise, the avoidance of ill-ventilated rooms, smoking, alcohol, and strong tea. If this does not seem effectual, cauterising with the fine galvano-cautery point is useful (pp. 112, 239) but often has to be repeated. The tendency for this trouble is to gradually disappear.

NASAL ASTHMA.

Of all the diseases and symptoms and morbid conditions, including goitre, enuresis, dysmenorrhœa, and many others, believed to have been cured or relieved in a reflex manner by intranasal operation, including cauterisation, those relating to spasmodic and vaso-motor affections of the respiratory tract, such as asthma, stand on by far the firmest ground, and amongst the intranasal operations, removal of polypi and cauterisation of hypersensitive areas have given most markedly good results. The tubercle of the septum, as well as the inferior turbinate, have been shown to be very susceptible areas. And the removal of septal deformities has given very markedly good results in some cases. A rough idea, as to whether the treatment applied to the nose is likely to benefit the sufferer or not, is to be obtained by going over the nasal mucous membrane with a probe and noting whether hypersensitive areas are present, or areas which, on stimulation, seem to bring about or affect the attack. On the other hand, it should be noted whether a solution of cocaine applied to the mucous membrane has any effect towards checking it. A word of warning must, however, be given as regards this matter, and the surgeon should require fair evidence before he condemns the nose as the culprit at the bottom of these various affections: to operate on mere possibilities without such evidence is getting very near the domain of quackery. However, that a bright light will often set up sneezing, and gentle passage of a Eustachian catheter lachrymation, show how easily complex reflexes may be set up in this region.

RHINOSCLEROMA, LEPROSY, AND GLANDERS.

The two first mentioned need hardly be thought of, except as regards persons coming from abroad, and are very rarely seen in this country.

Glanders, though rare, does occasionally occur, and the

possibility of this disease being present should always be considered if a patient who has to do with horses presents himself with ulcers on the nasal mucous membrane.

The bacteriological examination in all these cases is of great importance, as in each a specific organism is present.

THE SEPTUM.

The septum nasi is rarely altogether plumb in the middle line, but this deviation, without symptoms, calls for no interference, and the same applies to the ridges or spurs which so commonly project from it, and which may be either bony, cartilaginous, or mixed. The deviation may be—

1. **Developmental.**—Due, apparently, in some cases to insufficient space, owing to the projection upwards of the high arch of the palate below. To account for the numerous cases, however, which occur in persons with normal palates, other theories have to be invoked, such as pressure when habitually lying down on one side, and dragging the nose to one side when blowing it.

2. In those of **traumatic** origin the septum is thickened at the bend, which is situated in its anterior part. Speaking generally, developmental deviations are wide and rounded, the traumatic angular. They vary very much, however, but may be classed roughly as irregularly C-shaped or S-shaped on section, so that a double obstruction is produced; and, anteriorly sometimes, the quadrilateral cartilage is dislocated to one side, so as to more or less block up the vestibule. The posterior margin of the septum, which is formed principally by the vomer, is very rarely affected, being almost always quite in the middle line. The turbinate, either middle or inferior, which is opposite the concavity of a deviated septum, is apt to be marked by a compensating enlargement, so that it bulges into and more or less fills the space which would otherwise be left. If this is not the case the cavity here

will be too spacious and the membrane apt to be dry, atrophic, and more or less covered with crusts.

Spurs or ridges, which differ from deviations, in that, unlike the latter, there is no corresponding concavity on the opposite side, are most commonly found along the junction of the vomer, with the perpendicular plate of the ethmoid and quadrilateral cartilage of the septum in a line running backwards and upwards from the anterior nasal spine. Deviations and spurs may be slightly marked, or so prominent as to press firmly against the turbinate bodies, and have even been known to penetrate the antrum.

Non-traumatic thickening of the septum takes place most commonly in the region of the tubercle just opposite to the anterior end of the middle turbinate, and consists largely of hypertrophied glands.

OPERATION is undertaken with a view to removing nasal obstruction in some form, whether it be to air, to discharge, *e.g.* escape of pus in sinus disease, or to instrumentation, *e.g.* the passage of the Eustachian catheter. A slight obstruction seems in some cases to give much more distress than a greater amount in others, so that, when considering the desirability of operation, considerable stress must be laid on individuality.

At the present time the operation of submucous resection of the septum nasi has practically taken the place of all others, so good have been the results from it. It no doubt takes longer to do than the older operations which it has superseded, but, on the other hand, the healing process takes about as many days as the others did weeks, and the mucous membrane is left almost intact. It may be performed under local anæsthesia, packing the nose with strips of gauze soaked in a mixture of cocaine 20 per cent. and adrenalin 1 in 1000, and left in position at least half an hour. The walls of the nasal cavity must be very carefully papered with the gauze, so as to get thorough contact. Also, to get a more complete

anæsthesia, solutions made from tablets, such as are used by dentists, containing novocaine, with suprarenin, or eucaine, may be injected beneath the perichondrium, or a general anæsthetic may be administered; but if this course be adopted, without the previous use of adrenalin, hæmorrhage during the operation is likely to be troublesome. To give a general anæsthetic after *injecting* adrenalin submucously appears to be a dangerous proceeding. Opinions differ, but except in slight cases, where the cartilage only is affected, a general anæsthetic is, on the whole, advisable; otherwise, though the patient may feel but little actual pain, he is very apt to carry away and retain decidedly unpleasant memories, especially as regards feeling the chiselling and punching of the bone with forceps. However, with small spurs and ridges, a local anæsthesia will generally be sufficient, unless the patient is very nervous. These also should be removed as far as possible submucously. An incision having been made along the apex of the projection, the membrane on the upper surface is turned up and kept out of the way, while the cartilage or bone is removed by means of a spoke-shave, saw, chisel, or forceps, and the flap allowed to fall down over the raw surface. The submucous resection operation for straightening a deflected septum is not easy, and considerable skill and practice is required for its successful performance. Indifferent operators are prone to remove too little, and consequently not cure the obstruction, or, on the other hand, make perforations which, if anteriorly situated, are associated with crust formation, and sometimes unpleasant noises when the patient breathes.

An incision is made through the muco-perichondrium on the convex side of the deviation, and well posterior to the anterior margin of the quadrilateral cartilage, as in that part the muco-perichondrium is too closely adherent to be easily deflected. The flap is turned backwards and upwards, the cartilage is then perforated, and the perichondrium on

the opposite or concave side freed. The cartilage is then removed with Ballenger's knife and forceps, and the bone with forceps and chisel, leaving, however, a considerable margin anteriorly: the nose may be afterwards packed with rubber sponge. If, however, there is no hæmorrhage, and the flap can be kept in position by one or two stitches, it is better not to pack at all. The septum now consists of mucous membrane and two layers of perichondrium or periosteum, and after the operation should fall back into the middle line. If the turbinates are much enlarged from compensating hypertrophy on the side which was the concavity of the deviation, it may be necessary to reduce them, especially the middle. This may be done at the time of the operation with a snare or forceps, but it is generally better to leave the inferior turbinate, at any rate, for a while, as it may shrink. Very little after-treatment is necessary. If there is any discharge, a coarse alkaline spray will be found useful. In all but exceptional cases, any packing or stitches it may be found necessary to use should be removed within twenty-four hours.

The principal complications and sequelæ which may occur with this operation are—hæmorrhage, perforation, adhesion, and flapping. The three first are described on pp. 139, 140, 141; the last generally disappears after a time.

In children one should be very chary of doing any extensive operation in the way of removal of cartilage or bone, in order to avoid any possibility of subsequent deformity.

Dental surgeons claim to have widened the nasal passages considerably in cases of high-arched palate by means of an instrument worn in the mouth and pressing the alveolar processes outwards laterally.

Hæmatoma and Abscess of the Septum.—Hæmatoma of the septum is practically always traumatic, usually occurs in young people, and is generally bilateral, though often more marked on one side than the other. The patient comes

complaining of nasal obstruction, in addition to the pain and discomfort due to the trauma.

On examination, in a marked case, red, rounded swellings are seen on either side, just inside the vestibule, sometimes hanging down so much as to look almost pedunculated, and careful examination with the probe shows them to be soft and continuous with the anterior part of the septum. Hæmatomata in this region are very apt to suppurate, and the great majority of abscesses of the septum are simply suppurating hæmatomata, although occasionally they may follow infectious fevers.

Treatment.—If the hæmatoma is seen soon after the injury, and is small, it should simply be kept under observation, and cold applications applied externally to give it a chance of absorption without incision; but if, on the other hand, it is large in size, painful and tender, although the immediate discomfort due to the original injury has had time to disappear, free incision must be made on either side into the swelling, and good drainage secured till the discharge ceases. If the incision tends to close prematurely, it should be kept open with a probe; drainage tube, gauze, and horse-hair drains are better avoided here if possible. If in doubt, it is better practice to incise the swelling than wait, for perforation and external deformity are very apt to follow abscess of the septum, and this is more likely the longer the pus is left under high tension. The friends of the patient should always be warned that there may be some sinking in of the bridge of the nose; otherwise, there may be a tendency to ascribe this unfortunate result to the surgeon's treatment.

Perforation of the Septum.—One of the commonest causes of perforation is that due to ulceration at the anterior-inferior part of the cartilaginous septum. This is a particularly vulnerable spot, numerous small, thin-walled vessels being present which bleed easily, the immediate cause of the ulceration being probably rubbing or picking, due to irrita-

tion generally caused by dust. When seen early in the case, the lesion has the appearance of a small abrasion; this is irritable, and the scab which forms on it is soon picked or rubbed off. The process repeats itself, and goes on till a deep ulcer forms, which generally penetrates to the other side and perforates, leaving a dry, clean-cut hole, the edges being sharp and without infiltration. The ulceration may be checked by the application of pure carbolic acid, or nitrate of silver, followed by the application of dilute nitrate of mercury or ammoniated mercury ointment. Relapses, however, are apt to occur.

The position and sharply cut edge of this form of perforation are useful guides as to its origin.

Perforation also sometimes occurs in the fevers, such as enteric, and amongst workers in arsenic, copper, mercury, and chromic acid, and more commonly in syphilis and in tubercular disease, including lupus. A good many perforations must be accounted for, unfortunately, by operations on the septum. The history will in most cases help as to the etiology. Syphilis affects bone and cartilage, lupus only cartilage, and the edges of the perforation are infiltrated. The farther back the perforation is, the less likely is it to cause inconvenience, in fact, the patient is often quite unconscious of anything wrong. In the anterior part of the nose a tendency to crust formation and a whistling noise when breathing may be troublesome. Attempts to close a perforation by plastic operation, unless small, are generally futile, and should not be attempted. If ulceration is still going on at the edge, the same treatment should be used as in idiopathic ulceration above mentioned. In troublesome cases, which resisted other measures, I have obtained sound healing by separating the muco-perichondrium from the cartilage round the perforation, removing the latter freely, and bringing the flaps together again. In these cases the cartilage appeared to act as a foreign body.

Adhesions.—These are found most commonly between the septum and the inferior turbinate, and though they may be due to ulceration from syphilis or other disease, they most commonly result from unskilful or injudicious operation; two raw surfaces having been left in contact, adhesion results. Probably the galvano-cautery is the chief offender in these cases.

Treatment.—If the adhesion is apparently doing no harm to the patient, mentally or bodily, it should be left alone, but if it causes obstruction to breathing, to escape of discharge, or to instrumentation, it must be removed. Active treatment, however, should be avoided while the nose is swollen and inflamed. Attempts to cure the condition by separating the adherent surfaces, and the insertion between them of a plug, generally ends in failure, because the surfaces will probably not heal while the plug is present; but still, a trial may be made with a piece of gauze smeared with vaseline and removed daily. Supposing, however, that all inflammation has subsided, the uniting band of tissue must be not only divided but freely removed, as if it were a growth, so that the raw surfaces are well away from each other. Only if hæmorrhage is troublesome should any plug be introduced.

EPISTAXIS.

Besides injury, the causes of epistaxis are numerous and varied. Visceral disease, especially kidney, heart, and liver, arterio-sclerosis, purpura, hæmophilia, scurvy, plethora, the fevers, angio-fibromata, malignant growths, pregnancy, vicarious menstruations, are some of the most important. When due to a local cause, the most common point of origin is a vascular spot on the anterior-inferior part of the septum, called Kiesselbach's area, but not infrequently it may be a point on the inferior turbinate or floor. The onset is generally quite sudden, though sometimes previously a fulness or tickling in the nose is felt, and the quantity of blood may vary from a few drops to profuse flow. The

patient must be kept at rest, and if the bleeding has ceased, on the doctor's arrival, leave well alone is the best motto, unless the patient lives far from skilled assistance. Slight bleeding should be given a chance to cease spontaneously; if it persists, the nose may be sprayed with adrenalin, 1 in 2000, or hydrogen peroxide solution, or, if a small piece of dry cotton-wool be applied as near as possible to the bleeding spot, it will often cease, the patient at the same time breathing steadily through the nose. Only if profuse or persistent will further treatment be necessary, though, as a matter of fact, the surgeon very seldom sees the case until various domestic remedies have been tried. The first thing, on his arrival, however, should be to, if possible, locate the bleeding point, and if as is often the case the patient is nervous and restless a small dose of morphia given hypodermically is very useful. The exact origin, unless the hæmorrhage is subsequent to operation, is presumably unknown, therefore the nose should be freed from clots by hot or cold boric solution; as hot as can be borne is the best. If the bleeding is then so free that the origin cannot be localised, gauze soaked in adrenalin solution should be packed in the nose for a minute or so and then quickly removed, when it is probable that the spot can be identified, and if wiped over with a flat galvano-cautery point at a dull red heat, may be effectually sealed. If not, pack the cavity with gauze soaked in adrenalin solution, 1 in 4000, for twenty-four hours. If the blood comes from an invisible spot at the back, the case will be a very difficult one. A spray of adrenalin solution or peroxide of hydrogen had better be tried, and the patient may be made to sit up, so as to promote faintness and consequent cessation of hæmorrhage. Plugging the posterior nares should be kept as a last resort, remembering that death from epistaxis is very rare, and that the plug in the posterior nares very rapidly becomes septic, and may set up inflammatory troubles, to

which persons who have lost much blood are particularly susceptible. When, however, it is absolutely necessary, the bleeding still continuing, and other measures having proved unavailing, a piece of stout silk is attached to a new rubber catheter, a piece of drainage tube, or the eye of a probe, and passed by this means through the nose into the post-nasal space. The patient now opens his mouth, and when the silk appears from behind the palate it is drawn out of the mouth, and a plug of gauze, about the size of the last joint of the thumb, attached and pulled up by means of the thread into the corresponding choana. It is important that the plug should not be too large, or it will remain in the post-nasal space and do no good—or too small, as in this case it is liable to be pulled right through and out of the nose. The end of the silk which comes out of the mouth, and the other end which comes out of the nose, may be tied together and fixed by means of plaster to the cheek. The plug should not be left in position for more than twelve hours, when it may be loosened with the hydrogen of peroxide spray, and gently pulling on the string coming out of the mouth. Spontaneous bleeding from the nose in persons over middle age should always arouse a suspicion of organic disease. In a number of cases of spontaneous epistaxis bad enough to be taken into the wards of a general hospital, and investigated by the author, 30 per cent. were found to have albumen in the urine.

AFFECTIONS OF THE NASO-PHARYNX.

Acute inflammation may originate in the mucous membrane of the naso-pharynx, though more often it occurs as an extension from the nose or pharynx, and is shown by rise of temperature, pain, and aching at the back of the nose, and on making any swallowing movement. It is more or less associated with acute inflammation of the adenoid tissue situated here, and already described (p. 32), and tends to creep up the Eustachian tube and affect the ears.

Chronic Post-nasal Catarrh is a very common and troublesome affection, due to nasal obstruction, dust, damp, abuse of alcohol or tobacco, repeated colds, and other causes. The chief symptom is the discomfort caused by accumulation of mucus at the back of the nose, especially the first thing in the morning, and the more viscid it is the more annoyance it gives the patient, who endeavours to get rid of it by sniffing through the nose and putting the muscles of the pharynx and palate through various gymnastic performances, accompanied by sundry unmelodious sounds. A certain amount of deafness from middle-ear catarrh is very common in these cases, and so is dyspepsia, which is commonly ascribed to the unhealthy mucus swallowed.

Treatment.—In the first place, the patient's habits must be inquired into, and advice given as regards clothing and exercise; and smoking, except in strict moderation, prohibited.

Examination must be made for nasal obstruction and adenoids, and these, if found, should be removed, also sinus suppuration must be thought of as a cause. A cleansing alkaline wash used through the nose in the form of a coarse spray twice a day (p. 249), and an iodine paint (p. 249) applied by the surgeon with a brush to the post-nasal space twice a week, will relieve most, and cure some cases, but relapses are common.

There is one affection of the post-nasal space in which the secretion takes the form of an exceedingly sticky mass situated in the pharyngeal vault, shaped like a coin, and often about the size of a shilling. These pieces are generally discharged every few days, but only to form again. From the nature of the secretion, which resembles somewhat that discharged from a branchial fistula, and their obstinacy, one suspects that they may be connected with the unclosed pituitary involution of the buccal epiblast found in the foetus, called the pouch of Rathke, and sometimes spoken of as the

"pharyngeal bursa": post-mortem investigation, however, is badly needed on this subject; but whatever the pathology may be, one thing is certain, namely, that a cure is rare in these cases, the ordinary treatment for post-nasal catarrh failing lamentably.

Polypus.—Mucous polypus in the post-nasal space is generally single, differing in this respect from the ordinary nasal polypus. It is also larger, firmer, and contains more fibrous tissue. It often arises from the antrum being gradually extruded *via* the nose into the post-nasal space. It is said, when arising from the antrum, to make that cavity dark to X-rays, but bright to transillumination.

The symptoms are chiefly those of obstruction and nasal catarrh, and the diagnosis is made by means of a posterior rhinoscopic examination, though not infrequently the growth hangs so far down as to be easily visible without the mirror, coming down from behind the palate. It has the grey, semi-translucent appearance of nasal polypus.

Treatment is removal. If the polypus is partly in the nose and partly in the post-nasal space, it should be pushed back by means of a flat probe, and I have found the most satisfactory way of removing these growths to be by means of powerful adenoid forceps, such as Lowenberg's, guided to as near the root as possible by the forefinger of the left hand in the post-nasal space; then, by means of a dragging and twisting movement, the growth may be torn from its attachments. The snare has been largely recommended for this operation, but considerable difficulty may be experienced in getting the loop over the polypus, even with the finger in the post-nasal space. But little hæmorrhage occurs after this operation, and though these polypi occasionally recur, this is not nearly so frequent as is the case with the ordinary nasal polypi.

Naso-pharyngeal Fibroma. — This is a most serious disease, affecting young persons, most commonly males,

between the ages of 10 and 20. It arises in the majority of cases from the vault of the naso-pharynx, but may have intranasal attachments, and takes origin from the periosteum. The growths are often lobulated, and are apt to form adhesions to surrounding parts. They are reddish in colour, and of strikingly firm, tough consistency, differing in this respect from true malignant growths. They also possess a remarkable tendency to bore their way, apparently by pressure, so that sinuses, such as the sphenoidal, and even the skull cavity itself, may be penetrated through the various foramina at its base or by absorption through the bone itself, and meningitis set up. Sections show the growths consist of fibrous tissue, with dilated vessels, the vascularity differing greatly in different cases. There is marked tendency to local recurrence.

The symptoms in the earlier stages are chiefly those of nasal obstruction, but sharp attacks of hæmorrhage commonly take place from the nose from time to time, and the resonance of the voice is interfered with. Deformity is apt to result as the case proceeds, depending on the direction in which the growth happens to spread, producing frog-face, protrusion of the eyeball, and interference with its movements, and with sight, hearing, and deglutition. Ulceration may take place, with fetid blood-stained discharge, which is very troublesome at times.

The prognosis must be very guarded, owing to the penetrating character of the growth, its tendency to recurrence on removal, and to hæmorrhage.

Treatment.—This is by operation. Since the hæmorrhage is apt to be exceedingly free in these cases when operated on, I have been in the habit of giving calcium lactate, 10 grains three times a day for a week or more before operation, with apparently good results. Also it is desirable that a very careful examination by means of a finger, probe, transillumination, and X-rays be made, so as to get as far as

possible the exact lie and point of origin of the tumour. The question as to preliminary tracheotomy and splitting the palate so as to get better access, will have to be considered. The patient having been anæsthetised, the wire of an *écraseur* is now passed either through the nose or through the mouth and up behind the palate, according to the position of the growth. If the latter is sessile it may be very difficult to get the wire to hold, though a pedicle of sorts may be made sometimes with a *rugine*, taking care to get the instrument beneath the periosteum, when the growth may in some cases be more or less peeled off the bone. The remarkable leather-like toughness of these growths is shown by the way that stout wire snaps sometimes without cutting through. When this method fails, it may sometimes be removed piecemeal by means of powerful post-nasal forceps, seizing and twisting off the fibrous masses. The galvano-cautery is useful for cases which for some reason cannot be treated by the above methods, and for small recurrences. The hæmorrhage which may ensue at any stage of the operation is likely to tax the operator's skill. Swabs soaked in very hot water, adrenalin, peroxide of hydrogen, may all be tried, but corrosive substances, such as perchloride of iron, must be avoided; in fact, I have seen death occurring, apparently due directly to this latter having been applied. Packing with gauze or sponge is commonly resorted to. Sometimes the cautery is effectual when other methods have failed. Occasionally cases arise for which operations specially designed to give better access must be considered, and the one selected which seems most likely to suit the individual case. It is obviously desirable to avoid an external wound if possible, though the scar left eventually is often far less than might be expected.

Other non-malignant tumours occur, but are rare. The principal of these are—cysts, exostoses, teratomata, myxomata, and angiomas; and, in considering the probable

nature of a swelling here, abscess must not be forgotten, connected either with the subjacent bone or adenoid tissue.

MALIGNANT DISEASE.

Both carcinoma and sarcoma occur, but endothelioma appears to be the most common, and it is most frequently met with in young adult males. When the growth takes the form of a tumour it is not so difficult of diagnosis, with nasal obstruction, alteration of voice, hæmorrhage, and later fœtid discharge and enlarged glands; but if it takes the form of infiltration the matter is a different one, and attention has to be drawn to an interesting group of symptoms indicating a growth of this nature which commences in the pharyngeal wall in close proximity to the Eustachian tube.

The cardinal symptoms are—deafness, severe pain corresponding to the fifth nerve, beginning generally in the third division and extending to the second, with loss of sensibility in this area, defective mobility of the soft palate on the same side, and, late in the case, enlarged glands (deep cervical). Since the patient's chance of cure lies in early diagnosis, the above symptoms must always be carefully noted and weighed. A digital examination should also be made post-nasally, and if the trouble be due to this cause a hard infiltration will be detected.

Treatment lies in removal if diagnosed early, and for this purpose an osteoplastic resection of the upper jaw and malar bone may be necessary. Radium has given strikingly good results in some of these cases.

DISEASES OF THE ACCESSORY SINUSES.

These consist of the maxillary antrum, frontal and anterior ethmoid cells opening into the middle meatus, the posterior ethmoidal cells opening between the middle and superior turbinate, the sphenoidal sinus behind and above the superior turbinate. One or all of these may be affected,

at the same time, and inflammation may be acute or chronic, or an acute attack may be superadded to a chronic disease. If the openings of the various sinuses are closed, the pain, tenderness, and constitutional disturbance will be more, but of course the discharge will not be directly visible. After a time, however, the discharge bursts out and gives relief, but again closure may take place. The micro-organisms principally found in sinus suppuration are—staphylococci, streptococci, pneumococci, *Micrococcus catarrhalis*, *B. coli*, *B. influenzae*.

Operative treatment in multiple sinusitis may have to be piecemeal, and the order of procedure will have to be considered in each individual case.

Maxillary Antrum.—Acute inflammation of this sinus may arise from disease affecting the nose or teeth, and of these, nasal causes are more common. It may be brought about by an acute nasal catarrh; the fevers, such as measles, influenza; intranasal and dental operations, and foreign bodies; occasionally syphilis and tubercle, and spreading from another sinus.

Symptoms are chiefly tenderness and pain in the upper jaw, principally below the margin of the orbit, but also extending round into the frontal region, down into the teeth, and backwards into the temporal region. The degree of pain varies very greatly, but may be very severe. There is more or less tenderness to pressure over the anterior surface of the jaw. The nose feels obstructed, there is a moderate amount of fever—temperature 100° to 102° . If the opening into the sinus be not closed there will be a mucous discharge from the nose, rapidly becoming purulent, some of it also finding its way backwards, particularly when the patient is lying down. The discharge, on examination, will be found to be coming from under the middle turbinate, the mucous membrane of the outer wall of the middle meatus being red and swollen. If the case proceeds, and the ostium remains

closed, swelling, increased redness, oedema, and finally pointing of the abscess on the cheek may occur if not opened; this, however, is a rare occurrence.

Treatment, in the first place, is to allay inflammation by

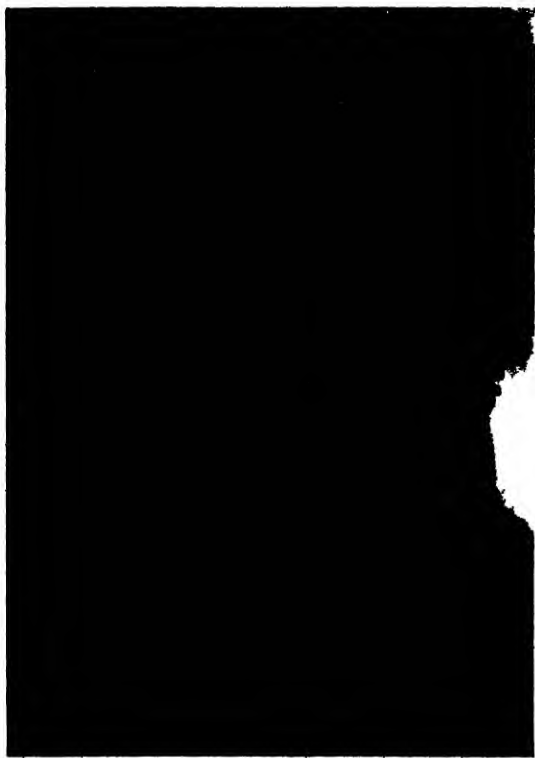


FIG. 54.—MAXILLARY ANTRUM; THE OUTER WALL HAS BEEN REMOVED.

hot fomentations externally; vapour menthol may be used by the patient, and a spray of cocaine and adrenalin by the surgeon, which relieves congestion and tends to promote escape of the discharge. A warm saline nose-wash is useful in some cases. The teeth should be carefully examined, to see whether the cause is likely to be here, and suitable treat-

ment adopted. If discharge does not occur, the antrum must be tapped and washed out with warm boric solution, either through a tooth-socket (bicuspid or molar) or beneath the inferior turbinate.

Chronic Suppuration may be the natural sequela of uncured acute suppuration, or may be of very insidious onset, the chief symptom being purulent discharge from the nose, which also runs back into the throat, this being particularly noticeable the first thing in the morning, when the patient gets up. Whiffs of an offensive odour are commonly noticed by the sufferer from time to time, and a disagreeable taste; also headache, and infra-orbital pain and tenderness. These are very variable and uncertain signs, but are accentuated should the ostium get blocked. General malaise is not uncommon; sneezing and coughing are sometimes troublesome. Antral disease is sometimes associated with polypi.

The diagnosis is made by the history and by examination.

1. *Pus seen beneath the middle turbinate body*.—When removed by a cotton-wool swab does not return when the head is kept in the erect position, but does when the head is bowed down to the knees and inclined to the sound side, supposing the disease to be unilateral. It should be kept in this position for a minute or two to allow the pus to escape out of the now dependent ostium.

2. *Transillumination*. — A small electric lamp on a holder, and preferably protected by an additional glass cap, since the lamp gets hot,—a fact which may make itself known in an unpleasant way to the patient,—is introduced into the mouth and held under the hard palate, and the lips closed round it. The room must be dark, or a dark cloth cover the surgeon and patient. Should an upper tooth-plate be present it must be removed. Now, if the light be switched on, and the antrum be normal, a more or less general red glow will be given to the cheek; but the special points to be

noted are—the appearance of a red luminous crescent under the lower eyelid; also the pupils are more or less illuminated, and a streak of light appears on either side of the nose, being transmitted by the ethmoid. The patient, when asked, will generally say that he perceives a dull red light in his eyes when closed; this, however, may be made much more noticeable by switching the light on and off, the eyes being shut, the difference between the red glow and total darkness is easily detected by the patient, who, in a case of unilateral suppuration, will state that he perceives a red glow in one eye but not in the other (*vide* Frontispiece). Failure to transmit light is evidence, but not proof, of pus in the antrum, for thickened walls and solid tumours may produce the same effect. On the other hand, cysts and polypi sometimes even increase the luminosity, so that, to arrive at a correct diagnosis, these results must be weighed in connection with other evidence. If a *skiagram* be taken, the pus-containing antrum also looks dark, but so do other diseased conditions. **Further, substantive proof is indicated by washing out the antrum.** This may be done through the natural orifice or by puncture below the inferior turbinate, or through the socket of a decayed tooth, molar or bicuspid, after extraction, or through the canine fossa. Recent opinion is somewhat against any operation which sets up a communication with the mouth, and this excludes the last two methods; the way in which the cavity is washed out by means of a curved cannula, passed into the antrum through the natural opening beneath the middle turbinate, is apt to be more difficult and more unpleasant to the patient than the last method, which is that chiefly in vogue. In this operation the outer wall of the inferior meatus is well cocaineised with a little 20 per cent. cocaine on cotton-wool, passed beneath the inferior turbinate, and allowed to remain here for fifteen minutes, the head being held sideways, with the diseased side downwards. The head being now held erect and supported by an

assistant or the left arm of the surgeon, the point of the instrument is placed against the inferior meatal wall, at about an inch from the anterior end of the inferior turbinate and passed steadily and firmly outwards into the antrum. The spot selected for piercing the wall must not be too near the floor, as the septum between the antrum and nose is very thick here, and there will probably be difficulty in getting into the cavity; also, the patient's nose must be pressed over to the opposite side in order that the puncturing instrument may be sufficiently transverse. The instrument used may be a trochar and cannula, but, in my opinion, a sharp cannula, with syringe attached, which is used as a handle during the piercing, is more convenient; it is easier if the cannula is a little curved. Sometimes, also, bony septa interfere, so that the instrument may have to be withdrawn and another attempt made. Having apparently been successful in reaching the antral cavity, the operator, feeling the point of the instrument freely movable, withdraws the piston of the syringe, and if everything has gone well, and there is pus in the antrum, this should now make its appearance. The antrum may now be washed out with boric lotion, and this washing may be repeated at first daily; but if this does not produce a steady reduction in the amount of discharge, effective drainage must be produced by means of a permanent opening from the antrum into the nose beneath the inferior turbinate.

The above-mentioned little operation of puncturing and washing out the antrum requires some care and knowledge of the anatomical relationships of the parts, as, if the point of the instrument misses its mark, painful deep-seated inflammation is apt to be set up.

REMOVAL OF THE INNER WALL OF THE ANTRUM BELOW THE INFERIOR TURBINATE.—For this a general anæsthetic will in most cases be necessary. It is better, as a first step, though not absolutely necessary, to remove the anterior end

of the inferior turbinate with scissors and snare, or cutting forceps. This gives good and easy access to the middle part of the inferior meatus, from which the mucous membrane is removed over an area corresponding to the lower portion of the inner antral wall. This may now be thinned by a burr, so that it may easily be pierced by a pair of cutting forceps and cut away freely, so as to make a large hole into the antrum. The lower portion of the opening should be as nearly as possible flush with the floor of the nose, so as to give good drainage, and the anterior margin come well forward to facilitate the passage of a cannula for irrigating purposes. The opening has a marked tendency to diminish in size, so that a small one is quite useless. The cavity is now washed out daily through the nose with boric lotion. If this does not succeed after protracted trial, or the case when first seen is of very old standing, or diseased bone, foreign body, or polypus is suspected, it being understood that all diseased teeth have been already properly dealt with, a more radical operation is indicated; in this the mucous membrane and the periosteum are turned up over the canine fossa and an opening made with gouge or burr, sufficiently large to allow the tip of a finger being introduced and a thorough examination made, both by sight and touch. Whatever diseased condition is detected should now be removed as far as possible, but it is a mistake to try to completely curette away the lining membrane, as the cavity is too large for complete obliteration. If this has not already been done, a further opening must now be made into the inferior meatus in the manner above described. The wound in the canine fossa is now allowed to close, the mucous membrane being stitched over it, the subsequent syringing being done through the inferior meatus. In obstinate cases it is a good plan to change the lotion used for irrigation from time to time. Washes (p. 248) may be used; also the injection of a solution of nitrate

of silver, 2 grains to the ounce, or sulphate of copper, 3 grains to the ounce, can be used with advantage in reducing the discharge. Owing to its dependent position, the antrum is liable to be a receptacle for discharge from other sinuses, *e.g.* the frontal, so that one gets the so-called 'cesspool' antrum; and, obviously, to cure this the aforesaid offending sinus, which is the real source of the trouble, must be dealt with.

Acute Frontal Sinusitis.—The most marked symptoms of this complaint are—frontal headache, with tenderness to pressure and percussion, particularly when applied to the roof of the orbit just above the inner canthus, also there is pain on blowing the nose, and a feeling of fulness here, and there may be some swelling of the upper eyelid. The headache is often very severe, particularly if the opening of the sinus into the nose is blocked. It may, however, intermit. A moderate amount of fever is present. Great relief is felt when a free discharge takes place.

On making an examination intranasally, if the passage through the frontal nasal duct is free, discharge will be seen coming from under the middle turbinate, re-forming when wiped away with cotton-wool (contrast the antrum), the head being in the erect position. The mucous membrane, round the hiatus semilunaris, looks congested and swollen. In chronic inflammation a variable amount of pain, frontal headache, and tenderness, particularly in the spot aforementioned in the roof of the orbit, with general malaise and discharge of pus from the nose, are the usual symptoms.

On examination it is seen, as in the acute form, that matter is coming from beneath the anterior part of the middle turbinate; after cocaineisation it may be possible to pass a suitable curved cannula up into the sinus, but unless actually seen in position by X-rays it is impossible to be quite certain that the frontal sinus itself has been entered, as it may only be in an anterior ethmoidal cell. However,

having entered a cavity, presumably the sinus, this may be washed out with warm saline solution. In some cases transillumination may give us some assistance, but is not of nearly so much use as in the case of the antrum, these sinuses varying enormously in size. For this purpose, however, a rubber or vulcanite cap, with an aperture at the



Lamp
Rubber cap

FIG. 55.—TRANSILLUMINATION OF FRONTAL SINUSES BY MEANS OF A SINGLE LAMP WHICH IS APPLIED TO THE INNER CANTHI ALTERNATELY.

end, is slipped over the lamp used for the transillumination of the antrum, and this is placed against the orbital roof just above the inner cauthus, and, in the case of a normal frontal sinus, the anterior frontal wall will be more or less illuminated. The same is done on the other side and the two compared mentally, or the two sides may be tested together with two lamps of equal power: much reliance, however, cannot

be placed on these results. X-ray photography here is of value, both as an indication of the extent of the frontal sinus and as to the presence of disease. The two sides must be compared, the skiagram, of course, being much easier to read correctly if only one is affected; but, in any case, by compar-



FIG. 56.—TRANSILLUMINATION OF THE FRONTAL SINUSES WITH TWO LAMPS OF EQUAL POWER, APPLIED SIMULTANEOUSLY.

ing the photograph of the patient with that of another person known to be normal, useful information may be gained.

Treatment.—In acute frontal sinusitis the patient should be confined to his room, and the anterior part of the middle turbinate sprayed with 5 per cent. cocaine and adrenalin, 1 in 2000, and menthol vapour inhaled (see p. 244). If a polypus or fold of membrane appears to prevent free escape of pus, it should be removed, and in obstinate cases the



FIG. 57.—THE SINUSES. NORMAL CONDITION.

(By kind permission of Dr. Gilbert Scott.)

- | | |
|---------------------|---------------------|
| 1. Frontal sinuses. | 2. Ethmoidal cells. |
| 3. Maxillary antra. | |

anterior portion of the middle turbinate should be removed by scissors and snare, as this immediately overlaps the

opening into the middle meatus. Hot fomentations may be applied to the forehead, and sucking or blowing by means of a frontal sinus cannula cautiously introduced and connected with a Politzer bag sometimes gives marked relief by clearing

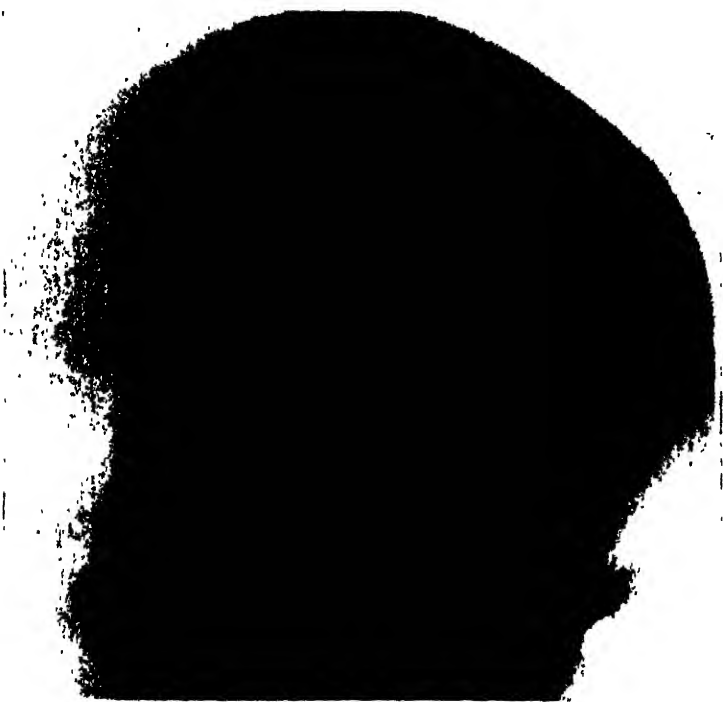


FIG. 58.—UNEQUAL DEVELOPMENT OF FRONTAL SINUSES.

(By kind permission of Dr. Gilbert Scott.)

the duct, or the patient may be able to clear it by making an inspiratory effort with the nose held and the mouth closed. In cases in which there is great pain and tenderness, or external fistula, or pointing of an abscess, or involvement of the orbit, or necrosis, or indications of intracranial extension, external operation must be performed. A good many cases have now been recorded, however, of a deadly sequela to this

operation, in the shape of osteo-myelitis; also, a certain though very variable amount of deformity is apt to be pro-



FIG. 59.—RIGHT ANTRAL SUPPURATION.
Note tube introduced through tooth socket.

(By kind permission of Dr. Gilbert Scott.)

duced by external operation; also, many cases either get well without it or are greatly improved, so the tendency now is to

avoid it except when absolutely necessary. When external operation, for one of the above reasons or some other cause,

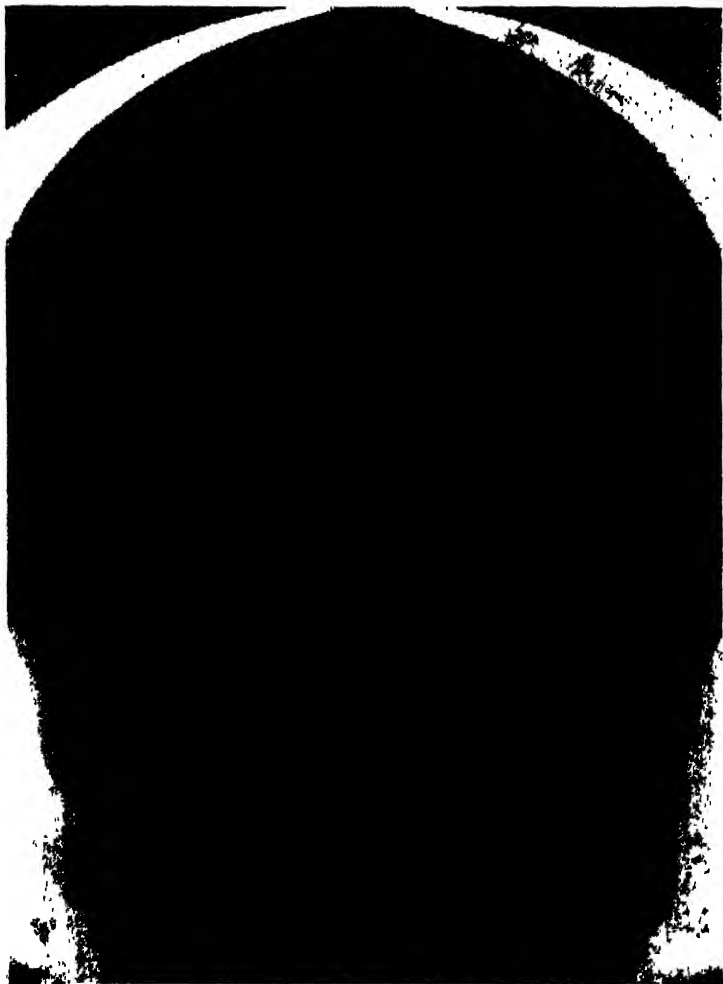


FIG. 60.—SUPPURATING LEFT FRONTAL SINUS.

(By kind permission of Dr. Gilbert Scott.)

has to be performed, the anterior wall and floor of the sinus are removed, leaving in some cases a bridge of bone correspond-

ing to the orbital margin in order to lessen the deformity, and freely enlarging the natural opening into the nasal cavity with a gouge or burr. In other cases, when obliteration of the cavity is not attempted, the hope for cure lies in procuring free drainage; the sinus having been opened and cleared out, with as little damage as possible being done to its walls, is then very freely connected with the nose. Careful examination must be made for disease of the ethmoidal cells, one of which commonly extends over the orbit, as neglect of this precaution is a cause of a good many failures to cure.

Intranasal treatment consists in removing the anterior portion of the middle turbinate, taking away polypi, opening and removing, with the punch forceps and curette, diseased ethmoidal cells. This, which is generally done under local anæsthesia and at several sittings, requires much skill on the part of the operator and patience on the part of the patient. The parts must be thoroughly illuminated, and nothing should be done while they are obscured by blood. The relations of the orbit and cribriform plate must be borne in mind. Recently, assisted by X-ray photographs, intranasal operations on the frontal sinus with guarded burrs, punch forceps and a sharp hook have been revived with a considerable measure of success. By these various means drainage may be much improved, so that the cannula can be passed up without difficulty, and the sinus may be washed out with boric acid or alkaline lotion.

COMPLICATIONS.

The Extension of Inflammation to other Parts.—Extension to the orbit, with abscess, œdema of the eyelids, and suppuration of the lachrymal sac may occur from extension from the frontal sinus and anterior ethmoidal cells, the infection taking place apparently in several ways, either by direct contiguity, venous or lymphatic channels.

Intracranial complications may also occur in the same

way with meningitis and cerebral abscess. When the infection takes place from a source further back, *i.e.* the posterior ethmoidal cells or sphenoidal sinus, the most

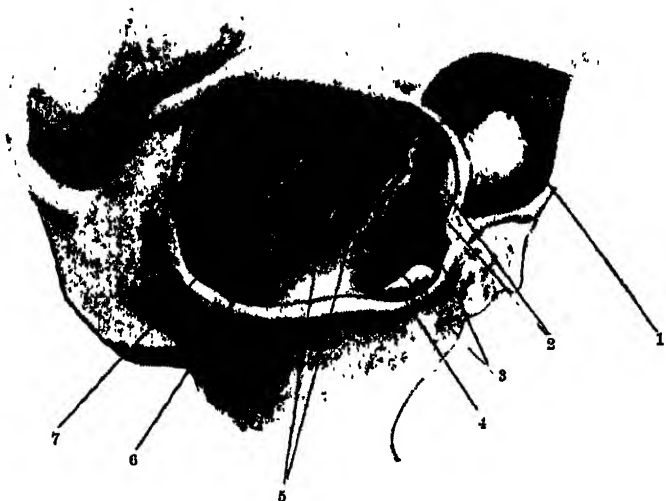


FIG. 61.—SPECIMEN SHOWING THE RELATIONS OF THE FRONTAL SINUS, ETHMOIDAL CELLS, AND SPHENOIDAL SINUS TO THE ORBIT.

The cells have been laid open by the removal of their outer walls.

- | | |
|------------------------------------|-------------------------------|
| 1. Frontal sinus. | 4. Groove for lachrymal sac. |
| 2. Cells in the roof of the orbit. | 5. Posterior ethmoidal cells. |
| 3. Anterior ethmoidal cells. | 6. Sphenoidal sinus. |
| 7. Optic foramen. | |

common result is that the eye is more likely to be affected, producing atrophy, neuritis, and paralysis of the muscles of the eyeball; diplopia, narrowing of the visual field, and central scotoma. Any indication of the inflammation spreading to the orbit requires immediate

attention, for pus, unable to get proper vent here, may not only destroy the sight, but cause fatal septic thrombosis of the cavernous sinus; in fact, it is not too much to say that when ocular or orbital signs and symptoms arise, which are not clearly accounted for in other ways, the nose and post-nasal space should invariably be examined.

Ethmoidal Cells.—These are generally more or less affected, in common with the frontal sinus, particularly, as one would expect, the anterior group: but as the anterior and posterior cells are in immediate contiguity, in fact, overlapping, in extensive disease of one group the other seldom escapes. There may be acute inflammation of these cells, with headache, pain at the root of the nose, the headache being generally frontal but also not infrequently at the back of the head; marked tenderness to the probe, and congestion of the mucous membrane in the middle turbinate region, and discharge of pus; but the disease most commonly presents itself in the chronic form, when the patient complains of stuffiness in the nose, variable amount of dull pain, of nasal obstruction, often intermittent, neurasthenic symptoms, and purulent or watery discharge.

On examination anteriorly, a polypoid condition of the middle turbinate, with exudation of pus from beneath it and swelling of the unciform process, are common appearances. On gentle examination with a blunt probe, dead bone, or bone undergoing a process of decay, is very commonly detected. Smell is often more or less affected. On examination with the posterior rhinoscopic mirror, if the posterior ethmoidal cells are affected pus may sometimes be seen trickling down over the posterior end of the middle turbinate.

Treatment of acute ethmoiditis is very similar to that of acute frontal sinusitis, though it may also be necessary to open the ethmoidal cells in the nose. For this purpose a sharp hook has been recommended. For *chronic ethmoiditis*, except in rare cases, the treatment is purely intranasal; in

the first place, the nose must be cleansed with alkaline lotion, preceded, if the pus is sticky, with peroxide of hydrogen spray. The polypi or polypoid middle turbinate should be removed, and any cells from which pus exudes, or dead bone felt, cleared out with cutting forceps or curette, having due respect for the very important anatomical relationships of this region. The contact of a steel instrument with rotten bone fortunately feels very different from that with normal bone, the former being unnaturally friable—a point of considerable use in these manipulations. Local anæsthesia is generally sufficient; several sittings will probably be required. In cases where the disease is very extensive and the polypi rapidly recurring, some advise that a general anæsthetic be given, and an attempt to remove the disease by curetting at one operation be performed. This has been very successful in some cases, but, on the other hand, deaths have been recorded against it, and it certainly should not be advised unless the patient is in other respects physically fit.

Sphenoidal Sinus Disease.—Disease of this sinus is apt to be latent, though deep-seated, and occipital headache may be complained of, and there may be purulent discharge running down into the pharynx. It is often associated with other sinus disease, and may be discovered by the surgeon in the course of their treatment. If pus be found coming down from behind and above, between the septum and the middle turbinate, as seen by anterior rhinoscopy, and over the superior turbinate and along the posterior pharyngeal wall by posterior rhinoscopy, sphenoidal sinus disease may be surmised to be present; but a view of the opening into the sphenoidal sinus itself can only be obtained if the posterior portion of the middle turbinate is much atrophied, as in ozæna, or has been removed by operation, or if the parts have been forcibly separated by a special speculum. Under these circumstances discharge and granulations may sometimes be seen at the ostium itself, and to those skilled in

reading skiagrams useful information may be obtained in that way, a photograph being taken through the head vertically. When the disease spreads beyond the limits of the sinus, owing to its position very important and serious phenomena are apt to develop, such as optic atrophy, retrobulbar neuritis, orbital abscess, thrombosis of the cavernous sinus, proptosis, chemosis, meningitis.

Treatment lies chiefly in securing effective drainage;



FIG. 62. — INTRODUCTION OF CANNULÆ INTO THE FRONTAL, MAXILLARY, AND SPHENOIDAL SINUSES.

anything in the way of curetting, owing to the anatomical relationship of the parts, is too dangerous to be attempted. A blunt probe, with its point bent a little downwards and outwards, passed through the nose gently backwards and upwards, between the middle turbinate and septum, making an angle of rather less than 45° with the meatal floor, will strike the anterior wall of the sphenoidal sinus, and at the upper and outer part of this surface lies the ostium. If the probe be now passed gently through this foramen for about half an inch it meets the posterior wall, which in the normal condition

has a curiously hard feel, reminding one almost of bare bone.

The opening, however, is by no means always easy to find, and unless it can be plainly seen, the practitioner will be well advised to leave this region in the hands of the expert.

The *treatment* of sphenoidal sinus suppuration lies in lavage with boric acid or saline solution and the injection of such drugs as nitrate of silver solution, 10 grains to the ounce, also enlarging the opening with gouge, cutting forceps, and burr, the direction of safety being downwards and inwards.

Mucocoele.—Occasionally mucus collects in a closed sinus, distending its walls, thinning the bone, and producing various symptoms, according to position, *e.g.* in the frontal sinus, displacing the orbital contents. Eggshell crackling may sometimes be obtained on pressure. These cases, in which the fluid is free in the cavity itself, must not be confused with cystic disease affecting the mucous membrane lining the cavity. One of the leading features about these swellings is their painless character, which is very characteristic. The mucus may be either thick or thin. They may, however, become infected and suppurate.

Treatment.—Free opening and drainage is sufficient in most cases. If the middle turbinate be affected it should be removed as freely as possible, and the same applies to an ethmoidal cell when affected. As regards the frontal sinus, the treatment is on the same lines as for chronic suppuration.

Cysts of dental origin sometimes occur, involving the antrum and inferior meatus of the nose, producing swelling here and also bulging of the cheek. These cysts are often classified as dentigerous, containing a missing tooth; and dental, connected with the root of the tooth. They may be bright to transillumination, dark to X-rays, and give egg-shell crackling.

Treatment.—The lip may be turned up, the front of the cyst wall removed, the lining membrane scraped away, and the tooth, which is the cause of the trouble, dealt with. Sometimes it may be necessary to make a counter-opening into the inferior meatus, in fact to operate on these cysts entirely *via* the nose has much to recommend it.

Exostoses of the ivory variety sometimes affect the frontal sinus, and tumours are found occasionally in connection with the antrum which, though often described as exostoses, are really odontomes. Cases of what may be described as bony hypertrophy of the superior maxilla, commencing in its alveolar portion, have been described, and appear to be similar in character to certain cases which have been recorded, in which the chief symptom complained of is nasal obstruction, and on examination there is found to be marked bony hypertrophy of the inferior turbinate and adjacent part of the superior maxilla; in both cases the bone is remarkably brittle and porous and is easily removed, the prognosis being favourable. The suggestion that syphilis is the cause of this disease appears to require confirmation. These cases must not be confused with ossifying sarcomata.

III.

THE EAR.

BEFORE discussing affections of the ear, let us refresh our memories by recapitulating a few salient points in anatomy and physiology. Later on illustrations will demonstrate the most difficult and important relationships.

1. The external auditory canal is about $1\frac{1}{2}$ inch long, the outer part being cartilaginous, the internal bony. In its course from without inwards it is first directed a little upwards, then backwards and horizontally, and finally slightly forwards and downwards.

2. The Eustachian tube is about $1\frac{1}{2}$ inch long, the internal part being cartilaginous. It leaves the tympanic cavity about a quarter of an inch above its floor, passing downwards, forwards, and inwards, into the naso-pharynx. Its mucous membrane is lined with ciliated epithelium, the movements of which tend to send mucus into the throat. Its internal orifice is trumpet-shaped, and is opened by the muscles of the part.

3. The cartilaginous portion of both the external auditory meatus and the Eustachian tube is defective in parts, the gaps being filled in by fibrous tissue.

4. The **membrana tympani**, which blocks the inner end of the external auditory meatus and separates the *external* from the *middle* ear, consists of three layers—one from the skin of the meatus, one from the mucous membrane of the middle ear, and an intermediate fibrous one, in which the handle of the malleus, which passes from above downwards and backwards, is embedded. The membrane is irregularly oval in shape, and faces downwards and forwards

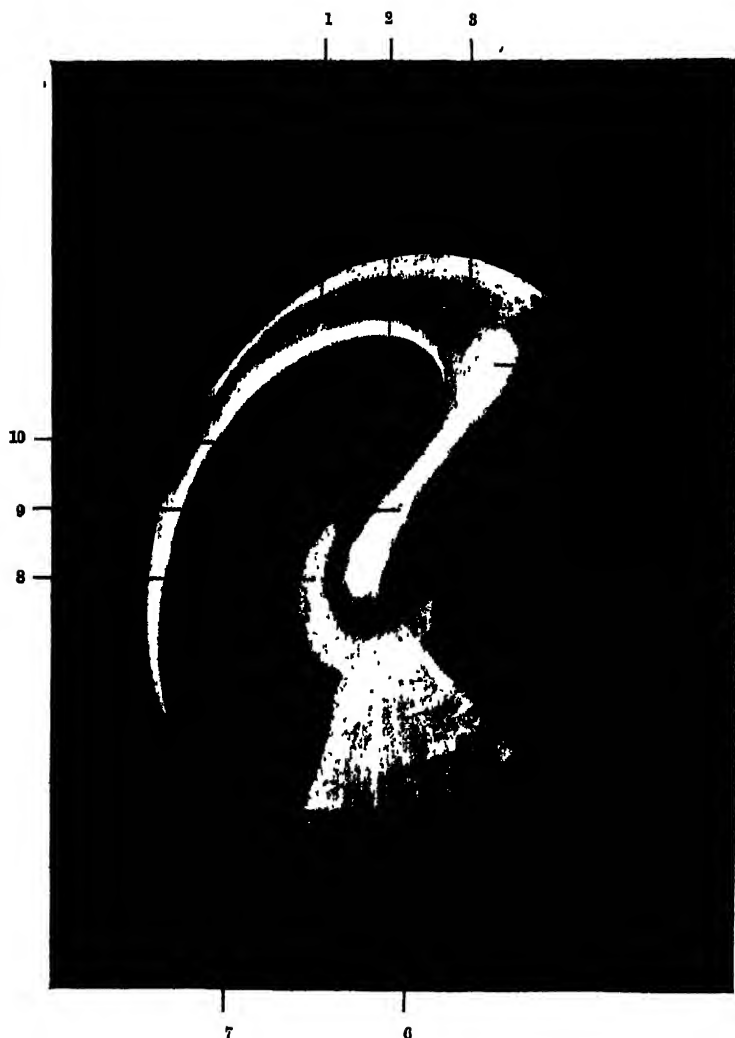


FIG. 63.—RIGHT MEMBRANA TYMPANI (AS SEEN THROUGH THE SPECULUM).

(Enlarged to about 8 diameters and rather more transparent than normal.)

1. Posterior fold.
2. Long process of incus.
3. Shrapnell's membrane.
4. Short process of malleus.
5. Anterior fold.
6. Cone of light.

7. Position of round window.
8. Umbo.
9. Handle of malleus.
10. Tendon of stapedius muscle passing backwards from the neck of the stapes.

and outwards, thus making an acute angle with the anterior and inferior walls of the external auditory meatus. The central portion is depressed. For purposes of description it is sometimes divided into four segments.

5. Just above the membrane, and limited below by the short process of the malleus, is the flaccid membrane of Shrapnell, above and internal to which lies the attic.

6. Internally to the membrana tympani lies the shallow cavity of the middle ear, roughly three-quarters of an inch high, half an inch wide, and a quarter of an inch deep, with the opening of the Eustachian tube anteriorly, and that of the aditus antri high up posteriorly. *Note* that the tympanum is not a plain cavity, but subdivided into pouches by folds of mucous membrane.

7. Of the three ossicles the malleus is intimately connected with the membrana tympani; the stapes by its base closes the oval window leading into the vestibule, thus separating the *middle* from the internal ear; and the incus, the intermediate link in the chain, lies largely in and partly blocks the passage termed the aditus, leading from the tympanic cavity to the antrum, which lies behind and above, and is not quite so deeply placed as the tympanum. Behind these again, and sometimes overlapping the antrum, is the lateral sinus, and above is the middle fossa of the skull, with its lining of dura mater.

8. The internal carotid artery, passing forwards, upwards, and inwards to the brain, comes into close relation with the tympanum anteriorly. The internal jugular vein passing down to the neck is just below the floor posteriorly, whilst the facial nerve, after running horizontally backwards in the inner wall above the footplate of the stapes, turns outwards and passes downwards in the posterior wall of the meatus just behind the attachment of the membrana tympani posteriorly.

9. At the postero-superior part of the external auditory meatus lies a small process of bone, "the posterior or supra-

mental spine," behind which is a small depression, the base of which is perforated by minute foramina. This depression lies over and is a guide to the antrum, which, however, is found at variable depths in different subjects.

10. Developmentally the Eustachian tube, middle ear, the



FIG. 64.—PREPARATION SHOWING THE RELATION OF THE LATERAL SINUS TO THE EXTERNAL AUDITORY MEATUS, ETC.

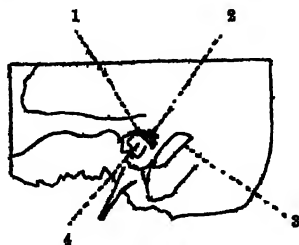


FIG. 64A.

1. Suprameatal spine.
- 2 Perforated depression behind 1, overlying antrum.

3. Corresponds to groove for lateral sinus internally.
4. Bony external auditory meatus.

antrum, and the external auditory meatus correspond to the first visceral cleft. At birth, the membrana tympani faces more directly downwards, and the antrum lies more above the tympanic cavity. The bony external meatal wall not being fully developed, and the facial canal being only partly ossified, the facial nerve is more exposed to injury. Also

the Eustachian tube is practically horizontal, a fact which may account for the frequency of infection in the middle ear from the naso-pharynx in early life.

11. As regards the internal ear, the anterior coiled portion, or cochlea, contains structures to which is attributed the *perception* of sounds, ranging in the human being from some sixteen to fifty thousand vibrations per second, whereas the



FIG. 65.—LEFT HALF OF THE SKULL OF A FŒTUS JUST BEFORE FULL TERM; BONY EXTERNAL AUDITORY MEATUS AND MASTOID PROCESS NOT YET DEVELOPED.



FIG. 65A.

1. Membrana tympani.

2. Inferior maxilla.

posterior or vestibular portion, together with the semicircular canals, is closely connected with the equilibration of the body. The middle and external ear are concerned only in *conduction*.

12. Disturbances of the vestibular apparatus produce nystagnus, difficulties as regards equilibration and orientation. This has been shown by experiments in birds, and disease and destruction of the semicircular canals in man, functional activity being tested in several ways.

Definite nystagmus may be produced in the normal subject—

- (1) By injecting cold (22° C.) or warm (37° to 42° C.) water gently into the external auditory meatus; the latent period before, and the duration of nystagmus being noted.
- (2) By rotation, the subject sitting in a revolving chair or lying on a revolving platform, ten revolutions in twenty seconds being the usual rate employed.
- (3) By electric stimulation.
- (4) By pressure, when a fistula is present in the external semicircular canal.

Nystagmus consists of two movements—a slow and a quick return motion; and it is termed right or left, etc., according to the direction of the quick movement, and it is accentuated by turning the eyes in this direction.

Some caution is necessary as regards the application of the tests above mentioned, as, besides nystagmus, giddiness, sickness, and deafness are apt to be produced in some cases.

The different kinds of nystagmus (horizontal, vertical, rotary) are produced by placing the head—that is, the semicircular canals—in different positions. The phenomena are believed to be due to a current set up in the endolymph, stimulating the nerve terminals of the vestibular branches of the auditory nerve, these currents being in different directions, according as to whether the temperature is being raised or lowered, the direction of rotation, etc.—for example, we note that after rotation to the right (clockwise), with the head erect, the horizontal and rotary nystagmus is produced to the left, lasting about forty seconds, and

vice versa; and cold water, from 20° to 30° C., injected into one meatus, produces horizontal and rotary nystagmus to the opposite side, whilst warm water, about 37° to 42° , gives nystagmus to the same side. Also, if a continuous current be passed through the head, one electrode being placed on one side of the head, the other in a neutral position, such as the hand, nystagmus will be produced, and is directed towards the cathode. Where a fistula exists between the internal and middle ear, as in the external canal, in some cases of suppuration, by raising the pressure in the external auditory meatus by means of Siegle's speculum or the Politzer bag, phenomena may be produced called the Fistel symptom, the head and eyes being jerked rapidly in the opposite direction, and a transitory, horizontal, and rotary nystagmus set up. A disadvantage of the rotary test is the fact that it must be applied to both sides at once, and the nystagmus, which results on the motion ceasing, is opposite to that which occurs during the movement, which obviously cannot be easily observed.

Equilibration is also tested by causing the patient to—

- (a) stand with feet together and eyes shut;
- (b) standing on one leg;
- (c) hopping;
- (d) endeavouring to stand on a plane inclined at different angles.

For examination of the ear, as in the case of the throat and nose, as good a light as can be obtained should be used, or, though in some patients the drum and deeper parts of

the meatus are easily seen, in a great many others this is by no means the case, and one frequently sees mistakes made simply due to defective illumination. The head mirror used in making laryngoscopic examinations will do also for the ear. After inspecting the mastoid process, meatal opening, and auricle, the surgeon draws the latter backwards and upwards, thereby straightening out the canal. If he cannot

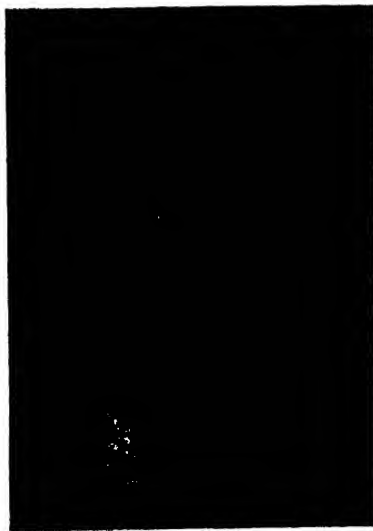


FIG. 86.—EXAMINATION OF THE EAR;
INTRODUCTION OF THE SPECULUM.

now see the deeper parts, which, in a small minority of cases can be done, he should introduce the largest speculum he thinks the meatus can take, and this will be a more pleasant manœuvre for the patient, if the instrument be warmed before introduction. No force must be used, only a slight pressure and a gentle twisting movement. If the instrument fails to pass, he must use one with a smaller

bore; also, it must only be passed sufficiently far inwards to give a view, and this should cause no pain. In some cases a Brunton's speculum, or a speculum fitted with a convex lens, may be of use to enable us to see details better, and a Siegle's speculum, an arrangement by which we can at will increase or lower the intrameatal pressure, at the same time watching its effect on the drum, is invaluable.

As in posterior rhinoscopy, the posterior margin of the

vomer is one's great landmark, so, in examining the ear, the handle of the malleus must be found first, and, except in old, suppurative cases, this is always present. Passing downwards and more or less backwards, it lies embedded in the greyish membrane, now identified for certain as the *membrana tympani*. At the lower extremity of the handle of the malleus is a depressed spot called the umbo, whilst at its upper end is the short process, and curving forwards and backwards from it are the anterior and posterior folds of the membrane, including above them the *membrana flaccida* before mentioned. Passing downwards and forwards from the umbo there is a bright area called the cone-shaped light reflex; this varies a great deal in different cases; some membranes are translucent,



FIG. 67.—RETRACTED MEMBRANE.

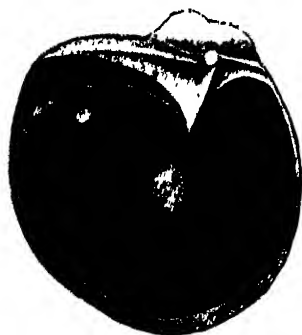


FIG. 68.—PREPARATION SHOWING MEMBRANE ALMOST ENTIRELY DESTROYED.

(Enlarged about 4 diameters.)

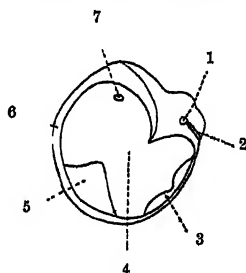


FIG. 68A.

1. Short process of malleus.
2. Anterior fold.
3. Opening of Eustachian tube.
4. Promontory.
5. Recess containing round window.
6. Remains of membrana tympani.
7. Head of stapes.

others not, and either may occur with normal hearing. With one which is fairly transparent, behind the manubrium, may be seen the long process of the incus, descending from above to articulate with the head of the stapes, passing horizontally backwards from which, is the tendon

of the stapedius muscle. Looming through the central part of the membrane is the yellowish promontory produced by the first turn of the cochlea; this area corresponds to the shallowest part of the tympanum. Behind and below this, in some cases, a rounded depression may be made out, corresponding to the round window. Occasionally, as a curiosity, the chorda tympani nerve may be seen arching forwards between the malleus and the long process of the incus. The view of the membrane may, however, be obstructed by the presence of wax, epithelial debris, and discharge, and the use of a swab syringe, or forceps, may be



FIG. 69.—PERFORATION OF
MEMBRANA TYMPANI
ANTERIORLY.



FIG. 70.—CALCAREOUS
PATCH BEHIND
MANUBRIUM.

necessary before a view can be obtained. Some common abnormal conditions which may now meet the eye are—

1. The so-called retracted membrane (Fig. 67), in which the manubrium is drawn backwards and inwards, giving it a fore-shortened appearance, whilst the *processus brevis* looks very prominent, and so do the anterior and posterior folds, whilst the curvature of the drum is obviously altered.
2. The membrane may be entirely wanting (Figs. 68, 69) exposing the interior parts, or be only perforated, perforations coming under three headings—
 - (a) From inflammation, when, if small, they appear as round, dark spots.
 - (b) Traumatic, slit-like, or irregular.

(c) Congenital, occurring occasionally in Shrapnell's membrane.

The perforation in turn may be filled in by—

3. A cicatrix, thin and translucent, and often difficult to see until a Siegle's speculum is used, or a drop of fluid may fill the hole, giving rise to an appearance known as a pulsating light reflex.
4. A relaxed membrane, in which the membrane seems too big, and flops about on one's using the Siegle speculum.
5. Calcareous patches (Fig. 70)—striking-looking, dense, white patches, often significant of past suppuration, but not by any means inconsistent with good hearing.

The principal symptoms of ear disease are **deafness, tinnitus, pain, and giddiness.**

DEAFNESS.

Deafness may have special reference to high or low tones, or the patient may hear better in silent surroundings, or in noisy ones, this latter being the so-called paracusis Willisii. Occasionally islands of good hearing may be present for certain notes, like oases in the desert. Anomalous conditions also sometimes exist, such as double hearing of one sound. All degrees of deafness may occur, and these often vary a good deal from time to time in the same patient.

TESTS FOR HEARING.

If deafness is suspected, having examined the ear, throat, and nose, we proceed to tests for hearing, and these are chiefly of three kinds—

1. The watch, or acoumeter;
2. The voice; and
3. Tuning-forks.

One ear must be tested at a time, the other one being tightly closed by the patient's finger. In special cases a noise-making instrument is placed at the ear not being tested, instead of the finger, so as to be sure of eliminating it as a hearing agent. The watch should be gradually brought near the ear from the side, from a distance, till the patient hears it, and then slowly removed until he fails to do so, and the mean of these may be taken as correct and the result expressed as a fraction. For example, let us say he hears the watch at 14 inches with the right ear and 9 inches with the left, and say we have previously ascertained that the watch in question is heard by a person with normal hearing at 40 inches, the fractions $\frac{14}{40}$ and $\frac{9}{40}$ give us roughly the proportion of hearing for the watch possessed in each case, and we make an entry in our notebook—

W. $\left\{ \begin{array}{l} R. \frac{14}{40} \\ L. \frac{9}{40} \end{array} \right.$

If the watch is only heard on its touching the ear, we put down—

“W. on contact only.”

Children, whilst being tested, should be asked to close their eyes, but, unfortunately, with them the results are very apt to be unreliable. The acoumeter is a small standardised instrument with which one makes a tapping sound, but its place is very well taken for ordinary purposes by the watch. On testing with the voice, the examiner sits or stands by the side of the patient, so that he does not see the examiner's lips, who addresses him in (a) a whisper, (b) a low voice, (c) a conversational voice, (d) a loud voice—using single words, and noticing the distance at which they are heard in each case. *Note* that vowel-sounds are more easily perceived than consonants; also that the letter R, as in “rumour” and “bruin,” has very few vibrations (128 per second), whereas the letter S, as in “study” and “kissing,” has numerous ones (about 10,000). After testing as above, one must pass to the

tuning-fork; for ordinary testing a C fork, giving 128 double vibrations per second, is suitable. This should have clamps to prevent over-tones as much as possible, and should be struck on a hard substance covered by a soft material, such as one's knee, or with a stick, the end of which is covered with rubber, and the prongs of the fork approximated to the meatus of the ear under examination, but without contact. The duration of time is now noted before the sound dies away, and this must be compared with the duration in a normal individual. This is termed the air conduction (A.C.). The bone conduction (B.C.) is tested in the same way, but the base of the fork is placed on the base of the mastoid process.

SPECIAL TESTS.

RINNÉ'S TEST.—In persons with normal hearing and those with affections of the *sound-perceiving apparatus*, the tuning-fork held at the meatus without touching is heard longer than when placed with its base on the mastoid. This is termed "Positive Rinné" (+R.), and the reverse, such as occurs in lesions of the *sound-conducting apparatus*, is called "Negative Rinné" (–Rinné). This is a useful test, but must be taken in conjunction with others. A medium fork, such as C or C¹, should be used: it gives the best results in marked cases of obstructive deafness; it is not reliable in old people.

WEBER'S TEST.—If, in a patient with one ear more deaf than the other, the tuning-fork, placed on the upper part of the forehead in the middle line, be heard more distinctly in the deaf ear, we know that the defect is in the *sound-conducting apparatus*, whereas if heard more distinctly in the good ear, we put the defect in the *sound-perceiving apparatus*.

SCHWABACH'S TEST.—Put the tuning-fork on the mastoid process of the patient, and afterwards on that of a normal individual, and note the time it can be heard in each case. If this be markedly less in the patient, his deafness is in the

this method, the patient, instead of drinking water, simply blows out his cheeks, the nares being held. Politzer's method is very useful in children and where there is great difficulty in getting a catheter through the nose, and it is less unpleasant to the patient than the use of this instrument. It is especially indicated in cases where both ears are affected.



FIG. 71.—INFLATION : POLITZER'S METHOD.

If used in a case in which only one ear is deaf, the meatus of the other should be plugged with wool or the finger during the operation.

3. BY THE EUSTACHIAN CATHETER.—This enables us to inflate one ear only at a time, and will sometimes succeed where politzerisation fails, and the blast of air is more under control with a catheter. The instrument should be passed with all ~~and~~ circumspection; laceration of the

perceptive apparatus; if markedly increased, in the conducting apparatus.

GELLE'S TEST.—This is useful sometimes in testing the mobility of the stapes, which is apt to be interfered with, particularly in oto-sclerosis. The intrameatal air pressure is raised by means of a Politzer bag. If this produces an increase of deafness it shows that the stapes is mobile. Deafness due to a defect in the conducting apparatus affects particularly the lower tones; that due to affections in the perceptive portion, the upper ones; and one requires a tuning-fork with a low note, such as C_2 , giving thirty-two double vibrations per second to test for defects in hearing low tones, and a Galton's whistle or other instrument, capable of giving very high notes, for testing for defects as regards high tones.

Inflation is not only an auxiliary method of examination, but also a most important form of treatment; but before employing it, one must see that no pus or other noxious material is lying in the nose or naso-pharynx ready to be blown into the ear. There are several methods employed, and in each case it is desirable to have an auscultation tube passing from the patient to the operator's ear, so that the latter may himself hear the air pass in.

1. **VALSALVA'S METHOD.**—The patient holds both nostrils closed with his thumb and forefinger, then shuts his mouth and makes a forcible expiratory effort, when, if successful, he feels the air pass into his middle ear. This method has not much to recommend it beyond its simplicity, and patients are apt to practise it on themselves to excess.

2. **POLITZER'S METHOD.**—The patient takes a sip of water in his mouth, and the nozzle of the rubber bag is placed in one of the anterior nares, and both are then firmly closed by the fingers and thumb of the left hand of the operator. The patient is then told to swallow, and at the same moment that he does so the bag is forcibly squeezed, when, if all is well, the air is felt to enter the tympanum. In a modification of

this method, the patient, instead of drinking water, simply blows out his cheeks, the nares being held. Politzer's method is very useful in children and where there is great difficulty in getting a catheter through the nose, and it is less unpleasant to the patient than the use of this instrument. It is especially indicated in cases where both ears are affected.



FIG. 71.—INFLATION : POLITZER'S METHOD.

If used in a case in which only one ear is deaf, the meatus of the other should be plugged with wool or the finger during the operation.

3. BY THE EUSTACHIAN CATHETER.—This enables us to inflate one ear only at a time, and will sometimes succeed where politzerisation fails, and the blast of air is more under control with a catheter. The instrument should be passed with all gentleness and circumspection; laceration of the

mucous membrane has been followed by free hæmorrhage, troublesome surgical emphysema, and other untoward results. The Eustachian catheters are tubes of metal, fibre, or vulcanite; the former are better for ordinary purposes, being sterilisable by boiling, and should not be longer than



FIG. 72.—INFLATION BY THE EUSTACHIAN CATHETER.
INTRODUCTION OF THE TIP OF THE CATHETER
INTO THE LEFT INFERIOR MEATUS.

necessary: silver is the best metal. They are generally made in three sizes, and that with a medium bore is most generally useful. The tube must be capable of being easily bent, and although a curve as shown (p. 5) is generally correct, it may have to be increased or reduced in different cases. The nose must first be examined to see whether any enlargement of the inferior turbinate body, septal deflection,

or spur is likely to bar the way. If the passage looks narrow, or the patient is nervous, apply a little 4 per cent. cocaine to the inferior meatus and wait a few minutes. The surgeon now, after telling the patient to steadily breathe through his nose, which is, by the way, a marked adjuvant



FIG. 73.—INFLATION BY THE EUSTACHIAN CATHETER.
PASSAGE INTO POST-NASAL SPACE.

to the proceedings, stands on the patient's right-hand side, or sits in front of him, and elevating the tip of the nose with his left hand, worms the point of the catheter along the floor of the inferior meatus, gradually raising the instrument from a vertical to a horizontal position. It is most important to keep the end of the catheter steadily on the floor of the meatus, as, should it by any means slip up above the inferior

turbinate body into the middle meatus, it is hopeless to try and reach the Eustachian orifice, and one had better begin all over again.

Having passed the catheter steadily along the inferior meatus, we now feel the end slip over the posterior border of the palate. Turning the instrument now through a quarter

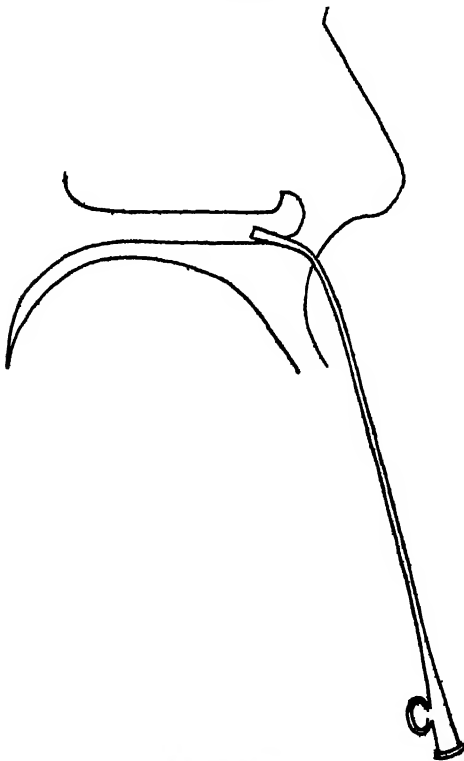


FIG. 74.—INFLATION BY THE EUSTACHIAN CATHETER.
COMPRESSION OF THE AIR-BAG.

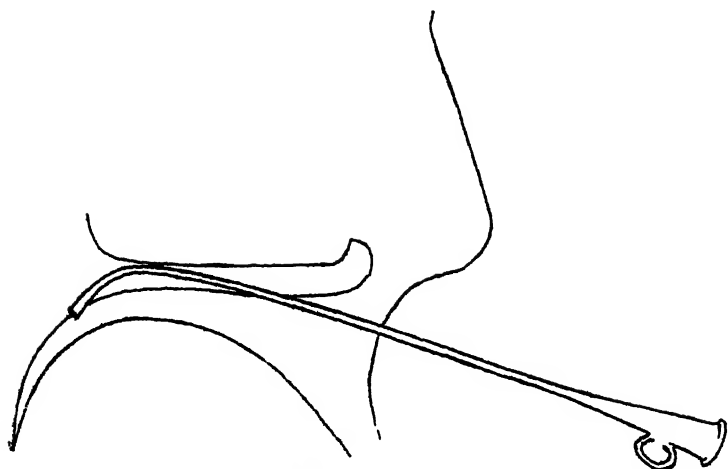
of a circle inwards, and slightly withdrawing it, the curved part hooks up against the posterior margin of the vomer. If now one rotates it downwards and outwards through a little more than half a circle, so that the point is directed to about the outer canthus of the eye, on the same side, we shall find that in the great majority of cases the point lies in the trumpet-shaped orifice of the Eustachian tube. We now join

up our catheter to the inflating bag, holding the former very steadily meantime to prevent its slipping out of position, the mount from the inflating bag being so made as to accurately fit the catheter. The bag may be suspended from one of the buttons of the operator's coat, and if a piece of rubber tube is interposed between the bag and the mount there will be less jar on the patient's nose when the former is compressed. The auscultation tube before spoken of being now in position, with one end in the corresponding ear of the patient and the other in one of the surgeon's ears, the air-bag is sharply

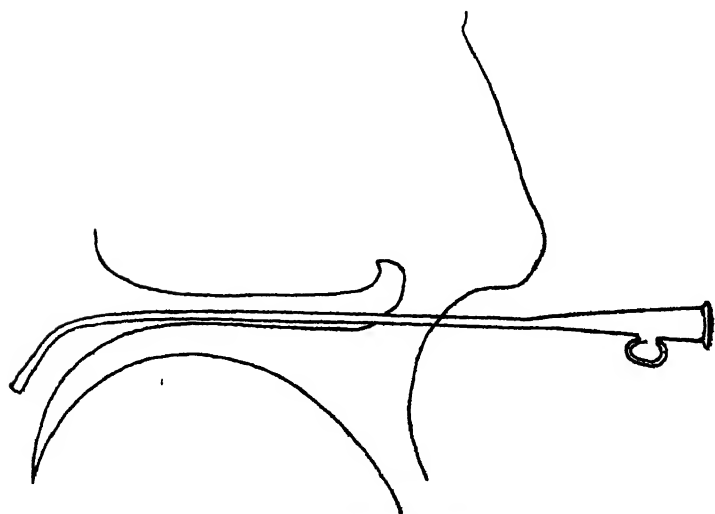
FIG. 75.—DIAGRAMS ILLUSTRATING PASSAGE OF THE EUSTACHIAN CATHETER.



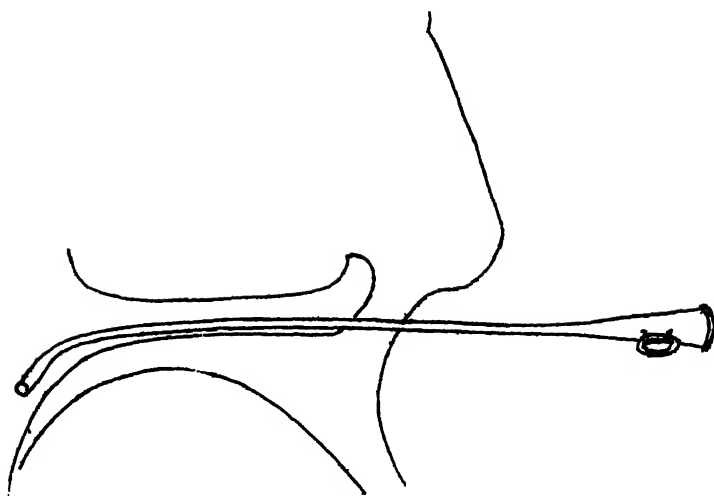
A. Entering meatus.



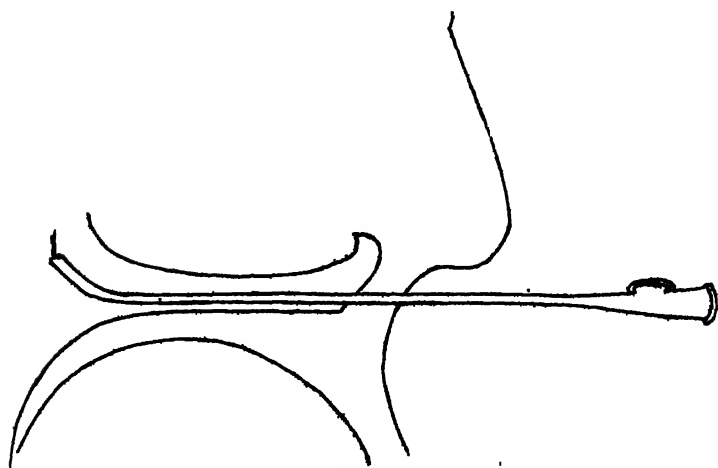
B. Passage through meatus.



C. Beak in post-nasal space.



D. Rotation inwards.



E. Rotation outwards and engagement of beak in Eustachian orifice.

compressed, and, if the manœuvre is successful, air will be felt and heard by the patient passing into his middle ear with a distinct blowing sound. This should be plainly heard also by the surgeon, but not quite as though blowing directly into his ear, for if this be so it indicates the presence of a perforation. Various modifications in the normal sounds may be heard, such as crackling, whistling, or moist sounds, according to the condition of the Eustachian tube and middle ear. Sometimes the surgeon is certain that he hears the sound correctly, but the patient is unable to detect the current of air passing into the tympanum, and *vice versa*. If the air does not pass in, ask the patient to swallow, and blow again simultaneously. If this does not succeed, it is best to remove the catheter and begin once more. It may be that the beak has slipped into Rosenmüller's fossa behind the tubal orifice, or that a spur or an involuntary contraction of the palate has shunted the tip of the instrument off in a wrong direction.

Another method is to pass the catheter in as before, but having reached the naso-pharynx, to turn the point a little outwards and upwards and grope along the outer wall of the naso-pharynx in search of the opening of the tube. In exceptional cases, such as when there is an insurmountable obstacle in the meatus on one side, or some lesion, such as ulceration, which renders it undesirable to pass the instrument along that side, it may be passed through the opposite one, *e.g.* through the right meatus for the left ear, but in this case the curved portion must be made much more extensive in order to reach across.

SIEGLE'S SPECULUM is an ear speculum, the wide orifice of which fits on to a small box covered with glass, which may be either plain or convex, so as to magnify. The metal form is the best, and there is also a nozzle fixed to the side of the box, so that a rubber tube may be attached to it, this being connected with a rubber ball or small metal pump.

The narrow part of the speculum must fit accurately the meatus, and this may be facilitated by having it covered with a small piece of rubber tube. By working the rubber ball or pump, the air in the meatus can be condensed or rarefied at will. This is useful in detecting cicatrices and old adhesions, and also in sucking fluid from the middle ear when perforation is present. Brunton's is another form of magnifying speculum in which the light is reflected at right angles.

EUSTACHIAN BOUGIES.—These, which are generally made of catgut or gum elastic, are used in some cases where blocking of the Eustachian tube is diagnosed from the difficulty which exists in producing satisfactory inflation. The catheter being in proper position, the bougie is passed carefully along it, having been previously marked, so that one knows how much is projecting beyond the extremity of the catheter, and this should not be more than half an inch. After withdrawal of the bougie the ear should be inflated, when, if the obstruction has been removed, the sound will be much clearer.

LUCÆ'S SPRING PROBE.—An instrument used to press on the short process of the malleus, with a view to mobilisation; it is a decidedly painful method of treatment, and requires much delicacy of touch.

PNEUMO-MASSAGE, the motive force being either electricity or the hand, has been found useful in some cases, especially in relieving tinnitus. In a minor degree this may be obtained by rapidly pressing with the top of the forefinger over the tragus, that portion of the auricle just in front of the meatus, or by Siegle's speculum.

ARTIFICIAL AIDS TO HEARING.

Drums made of rubber or cotton-wool are occasionally of use, more particularly in cases where the *membrana tympani* is more or less destroyed, but suppuration has ceased. Under these circumstances, if the patient is very deaf, it is worth trying to see whether a wick of cotton-wool, moistened with

liquid paraffin, can be placed in such a position at the bottom of the meatus as to improve the hearing. If, as occasionally happens, this result can be obtained, the patient may be taught to insert it himself. Unfortunately, however, a strong odour of quackery is associated with the subject of artificial ear drums, so that the practitioner must be careful.

INSTRUMENTS.

Of these the ELECTRIC or TELEPHONE AIDS seem likely in the future to outstrip all others, and a number of these are now on the market and are being steadily improved; and skilled mechanics exist who can make up an instrument of this kind, in accordance with the requirement of the individual patient. Of the other kinds a speaking-tube is very useful for ordinary conversation, and there are a large variety of instruments which give some assistance for distant sounds; but the patient had best be sent to a good instrument maker, who will allow him to try the selected instruments for a week or so before purchasing.

Under conditions in which it is necessary to deaden the hearing as much as possible, *e.g.* close proximity to artillery fire, the effect of the sound-waves is lessened by blocking the meatus on either side with vulcanite or rubber plugs or prepared clay or wool, or the Mallock-Armstrong ear defender, which is said to transmit soft sounds but not loud noises; also, the mouth should be kept open during the noise. Should Eustachian obstruction be present the damage to the ear is likely to be more severe.

Prolonged trial of the so-called re-education of the deaf, in which the voice, but also, more especially, a somewhat elaborate and expensive sound-producing instrument is used, has proved most disappointing in the vast majority of cases of acquired deafness in adults, but is of use in some cases of congenital deafness and also in some of those in which it has come on in early life.

TINNITUS.

Tinnitus, popularly called noises in the ear, is very common, and is often associated with deafness, but not necessarily. It is of two chief sorts—(1) Continuous, like the hissing sound of steam from a kettle; and (2) a pulsating sound, similar to the beat of a pulse, and all kinds of varieties of these exist. The sounds are commonly subjective, and rarely objective. As tinnitus is an exceedingly common and very troublesome symptom, it will be well to consider it in detail, for a patient is often much more worried by the noise he has in the ear than by the accompanying deafness. In investigating a case, it is desirable in the first place to get the sufferer to describe as accurately as possible the exact character of the sounds he hears, likening them, as far as he can, to well-known noises; and then to ascertain whether they are associated at all with deafness, for if the noises have been present for any long period without any deafness, it is very unlikely that any organic aural lesion is present. If, on the contrary, deafness is associated with tinnitus, examination with the tuning-fork and other tests will show what part of the aural apparatus is defective, and must be treated—for example, as in middle-ear catarrh.

No doubt intracranial vascular conditions may give rise to tinnitus. Both anæmia and hyperæmia modify pressure greatly; and the high blood pressure of arterio-capillary fibrosis in chronic Bright's disease, probably by the fact of the cerebro-spinal fluid, which should act as a damper, being more or less driven out of the cranium, may produce audible sounds. On the other hand, in anæmia the anatomical arrangement of the intracranial veins and sinuses render venous murmurs exceedingly probable. It should be carefully noted whether the sounds heard correspond to the pulse or respiration, and, apropos of this, it may be pointed out that a normal individual, on being placed in a perfectly silent place and told to concentrate his attention on himself

as regards audition, soon begins to hear sounds. As regards those produced apparently by causes inside the body, but outside the ear, circulatory abnormalities take a large share, and disease of the heart and blood vessels and abnormal blood pressure render both normal and abnormal sounds unduly audible, so that such affections as heart disease, goitre, and aneurism must be considered, and, if found, treated on general lines. One must also not forget general conditions of the patient with reference to anæmia, hysteria, and neurasthenia, remembering that in these affections a slight amount of disease may be to the patient enormously exaggerated, and a large part of the treatment lies in directing his attention from the sounds. Many different varieties of noise may be heard, such as humming, whistling, hammering, blowing, beating; but, as regards the hearing of actual voices, it must be remembered that this is the most common hallucination suffered from by the insane, and this aspect of the case may have to be considered. In rare cases muscles of the palate and middle ear produce a sound by contraction, which is distinctly audible. Another group of cases is that in which the trouble is due to a poison, such as salicylic acid and quinine, and these should always be thought of in conditions which are obscure. Digestive conditions have a marked bearing in some cases, and I have met with patients whose tinnitus was always very much worse if they ate meat.

Treatment.—If the noises appear to be one of the symptoms of some well-recognised aural disease, hope of cure will obviously lie in the treatment of that affection. If not, examination of the heart vessels and blood pressure, and also of the nervous system and digestive apparatus, must be made, and any abnormality found treated. Neurasthenia particularly requires proper attention. As regards the treatment of tinnitus merely as a symptom, bromides, hydro-bromic acid, strychnine, and valerianes have the best record, such as it is, and vibratory massage to the drum.

PAIN.

Although severe, throbbing, deep-seated pain in the ear is very significant of acute inflammation of the middle ear, and may radiate from thence in all directions, a good deal of pain, though not quite so deep-seated, occurs in furunculosis of the meatal wall, and both these affections are common; yet, besides these, there are a number of less severe and less persistent pains which are referred to the ear, but in which the diseased part is more or less remote, such as the pharynx or larynx, and there are other pains for which it seems exceedingly difficult, after careful examination, to find a cause at all, and which have to be classified under the perhaps somewhat weak appellation of neuralgic. When the middle-ear inflammation spreads to the deeper parts, such as the meninges, general headache and pain, particularly referred to the back part of the head, become more marked.

As regards tenderness, a rough but useful rule says, when the tenderness to pressure or on movement is most marked as regards the cartilaginous meatus, furunculosis is generally indicated. If the most tender point to pressure be just behind the ramus of the jaw, below the meatus, middle-ear inflammation may be suspected, and when behind the ear, mastoid and antral involvement. Tenderness to tapping of certain areas of the skull has been taken as an indication of subjacent abscess; tenderness in the upper part of the neck, along the course of the internal jugular vein, is one of the indications of inflammation having spread to that vessel. Particularly in persons getting on in life suffering from persistent pain in the ear, one must not forget the possibility of malignant disease, especially where the removal of granulations, polypi, or diseased bone has been followed by very rapid recurrence of the trouble. Sometimes a hyperæsthetic condition of the ear to sound is present, so that shrill noises,

e.g. those made by whistles, are decidedly painful. This is particularly so if the sound is unexpected, the ear being caught off its guard, as it were.

AURAL VERTIGO.

Aural vertigo, though not so common as the preceding symptoms, is of great interest as connected with affections of the vestibule and semicircular canals. The phenomena may be produced by syringing the ear with hot and cold water, rotation, and pressure on the drum, and occur much more readily in some persons than others. The semicircular canals, as has been shown both experimentally and clinically, when damaged or irritated, produce, by means of the endolymph contained in them, the phenomena of nystagmus and vertigo, the subject tending to fall in certain definite directions, depending on the position of the canal affected, *e.g.* if the patient be standing or sitting, so that the head is in the erect position; when, say, the left or so-called horizontal canal is affected, objects appear to rotate in a horizontal plane, and the patient tends to fall to the affected side (the left), and he has lateral nystagmus.

Besides these definite and specific kinds of vertigo there is associated with middle and internal ear disease a form in which the patient complains of giddiness, sometimes intermittent, in other cases always present, but with exacerbations in which the condition is much more indefinite, and the patient cannot give much more information than that he is giddy: and this appears to be due to a more general involvement of the vestibule.

In acute inflammation of the vestibule and in cerebellar abscess vertigo also occurs, and it is also common directly after a radical mastoid operation has been performed.

DISEASES OF THE EXTERNAL EAR.**MALFORMATIONS.**

It may be useful to remember that in early foetal life the external ear is represented by six small prominences round the external extremity of the first visceral cleft, and that the fully formed ear results from the growth and fusion of these prominences; also that, from irregularities in this process, we get—

1. Minute sinuses known as auricular fistulæ, secreting a honey-like material and situated in the rim of the ear (the helix).
2. Dermoids.
3. One or more accessory tragi,—small tags or tubercles in front of the meatus.

These may, if desired, be carefully dissected out.

Sometimes one sees cases of arrested development of the external ear, with atresia of the meatus, and is tempted to operate with a view to improving the hearing; but experience shows that the chances of success are exceedingly remote.

One of the common deformities is the **projecting auricle**, and something may perhaps be done for this in slight cases by means of a cap worn for a long period, pressing the ears to the sides of the head. To treat a bad case successfully by operation, it is necessary, not only to dissect off a flap of skin from the side of the head and a corresponding one from the back of the auricle, but also the cartilage must be removed, otherwise its elasticity will gradually produce a lapse. The raw surfaces are then carefully adapted to each other and the margins stitched.

HÆMATOMA AURIS.

Hæmatoma auris occurs as the result of a blow, or spontaneously in degenerates, such as the insane. A bluish

swelling forms, most commonly on the upper and posterior part of the external surface of the ear, the extravasated blood lying beneath the perichondrium. It is most important in these cases to give a guarded prognosis, as marked and obvious deformity is likely to follow.

Treatment.—In slight cases, at first try lead lotion, pad, and bandage. If the swelling goes on increasing, or is very large, aspiration. If this is not successful, free incision and removal of clots has given good results. If suppuration occurs, opening up and free drainage must be employed. A good deal of perichondritis and necrosis may occur.

Perichondritis may be due to injury, tubercle, or syphilis; sometimes it occurs after the mastoid operation, and has been shown in some cases to be due to the *B. pyocyaneus*. Keeping the parts aseptic, and application of a weak solution of nitrate of silver, 5 to 10 grains to the ounce, seems the best treatment. The auricle is one of the regions of the body particularly subject to gangrene, and this may result from frost-bite, Raynaud's disease, and noma.

EXTERNAL AUDITORY MEATUS.

Furunculosis.—This is one of the commonest diseases of the meatus, and is due to infection of the sebaceous glands or hair follicles by the *Staphylococcus pyogenes aureus* and *albus*. The boils may be superficial or deep-seated, single or multiple: recurrence is common. They may occur in the apparently healthy, but more commonly in debilitated persons, and the urine should always be examined in these cases. Sometimes they occur as a complication of middle-ear suppuration.

Pain and tenderness to pressure with a probe are marked symptoms; this latter is a very useful indication, because if the furuncle be deep-seated in origin the surface is not at first reddened, though the swelling is more extensive,

whereas, with the superficial ones, the swelling quickly becomes red, but is more circumscribed. As a rule, the temperature is not so high or the symptoms so severe as in acute middle-ear suppuration: the pain is increased by movements of the jaw or auricle. The presence of deafness depends on the extent to which the swelling blocks the meatus. Sometimes, when situated on the posterior wall the inflammatory oedema may extend back to the mastoid region, and a mastoid abscess from middle-ear disease be simulated. In some cases in which it is not possible to see the membrane, and the introduction of a speculum is apt to be a very painful proceeding, it may not be possible to altogether exclude middle-ear disease.

Treatment.—Palliative, to relieve pain. Drops containing 10 per cent. cocaine, 20 per cent. menthol, and tincture of opium may be used, or cacao butter cones containing morphia, but best of all is glycerine of carbolic acid, which should be instilled into the meatus, and gentle syringing with, and irrigations of, boric lotion employed. If rapid improvement does not take place, it will be necessary to make a free incision through the centre of the swelling, which will relieve pain and tension, and for this a general anæsthetic will usually be necessary. After an opening, either by bursting or incision, has been obtained, antiseptic drops, such as glycerine and carbolic acid, hydrogen peroxide, and lotions, such as boric acid, must be kept up for some time to prevent, if possible, recurrence. When this is troublesome injections should be used.

Sometimes the meatus is attacked by a more diffuse inflammation, the treatment of which is similar to above.

Eczema of the Meatus.—This is common. If acute, apply lead lotion; if of medium severity, as is commonly the case, clear out the debris, if necessary, by syringing with sterilised water, then dry carefully with cotton-wool, and apply ammoniated or dilute nitrate of mercury ointment.

If very chronic, apply a little nitrate of silver solution, 20 grains to the ounce.

Cerumen.—A moderate amount of wax is normally present in the meatus, but in some persons, either from excessive secretion, abnormal consistency, or from obstacles to its escape, it may accumulate, producing symptoms of which deafness is the most common. This not infrequently is of sudden onset, owing to the block becoming complete, also sometimes giddiness and tinnitus may be present, with a sense of dulness and fulness.

On examination, although wax generally appears as a brown, greasy mass, this is not always the case, for it may be hard, horny, and black, and though quite insensitive as a rule, it may be surrounded by such an amount of dermatitis, or be so closely in contact with the membrana tympani, as to give decided pain on one's attempting to move it with a probe. Also, where dust and dirt abound, deceptive appearances may be produced. Also cerumen may be mixed with hair, epithelial debris, pus, and choleastomatous matter. As to the deafness, it is of the obstructive variety, and bone conduction will be better than aerial. Since, however, there may be additional cause for the deafness, such as middle-ear disease, it is safer, if the hearing is very defective, to give a guarded prognosis as to complete recovery on removal of the wax.

Treatment.—If, on examination, from the appearance of the plug of cerumen, you conclude that there is a fair chance of easy removal, proceed at once to syringing with water, after separating the plug a little from the meatal wall with a probe; having filled the syringe (a 4-ounce sterilisable one is convenient) with warm sterilised water, any small remaining quantity of air is expelled by raising the point and pressing the piston. As the patient will not readily forgive the surgeon who uses too hot water or lotion, and as cold is decidedly unpleasant, it is most necessary to

make sure that it is just pleasantly warm, and this temperature the clinical thermometer will show to be about 100° Fahr., or the surgeon may test it by allowing a few drops to play for a moment on the back of his own hand. The patient being seated with a towel over his shoulder for protection,



FIG. 76.—METHOD OF SYRINGING THE EAR.

he, or an assistant, holds a bowl—preferably kidney-shaped—below the ear, closely in contact with the skin. The inner margin of the bowl must be kept a little higher than the outer, although patients, until shown, almost invariably do the reverse. The auricle is now drawn backwards and upwards by the operator's left hand, and the warm stream

of water directed into the crack between the plug of wax and the meatal wall which has already been found or made by the operator. Only moderate force must be used if success is not quickly obtained; or, if the plug looks very hard and difficult, it is better to soften it first by introducing into the meatus at bedtime a few drops of peroxide of hydrogen (6 vols.), saturated solution of bicarbonate of soda, or glycerine or liquid paraffin, and then plugging with cotton-wool.

The condition after removal of cerumen may be somewhat noteworthy; the hearing may be hyperacute or even painfully acute, though this gradually planes down to normal, or there may be a comfortable feeling of obstruction having been removed, with a return to normal hearing, or there may be dulness of hearing and tinnitus, which may be due to co-existing middle or internal ear disease, or to too much force in syringing, in which latter case it generally gradually disappears. After syringing, the meatus should be well dried with cotton-wool and a small plug left loosely in for a few hours.

A rough but useful rule is, that if on examination the patient is found to be so deaf that he cannot be made to hear loud conversation, the deafness is not entirely due to wax. A modification of the above condition, in which, in persons of advancing years, the meatus becomes blocked with masses of epithelium, mixed more or less with wax, has received the name of **keratosis obturans**. The plug may be very difficult to detach, and attempts to do this may cause bleeding. It should be thoroughly softened with one of the agents aforesaid, and then attempts may be made to remove it by syringing, which often has to be repeated. In skilled hands the aural forceps may materially assist the syringe in getting rid of the plug. A raw and sore condition of the meatus is apt to be left, which is best treated by a little oleate of mercury, ammoniated mercury ointment, or vaseline.

Stenosis of the Meatus.—This troublesome condition is due most commonly either to a chronic inflammation of the soft tissues or to bony growths, or a combination of the two. The patient generally comes complaining of pain or deafness and discharge, and the condition is discovered on examination by the surgeon. When the soft tissues are affected one must first treat any eczema or middle-ear suppuration which may be at the bottom of the trouble. After the cause of the inflammation has been removed, dilatation by means of a rubber or metal plug or tube has often been tried, but only gives temporary relief. If suppuration of the middle ear persists, in spite of thorough treatment, it is safer to do a radical mastoid operation, taking care to make a large meatus.

Bony growths are divided into exostoses and hyperostoses, according as they are localised or diffused. They have been attributed to bathing, gout, syphilitic and tubercular disease. After cleaning out the meatus, if necessary, the diagnosis is made by means of speculum and probe.

Treatment.—If not associated with deep suppuration, it is better to clean out the reduced meatus periodically, and treat any eczematous condition present with ointment. If, however, deep-seated suppuration is present, particularly if there be a history of recurrent attacks, and of cessation of discharge, accompanied by pain, a radical mastoid operation will be necessary, or removal of the exostoses, an operation often of considerable difficulty, and not free from danger.

Otomycosis—Fungus in the Ear.—This is more often seen in countries farther south than England. The most common form is an aspergillus. The patient generally complains of irritation and deafness in the ear, and sometimes pain. On examining the meatus the surgeon finds it occupied by a dirty white or sometimes reddish material of unfamiliar appearance, which, on microscopical examination, is found to be fungus. It is said not to attack a healthy meatus.

Treatment consists in cleansing the meatus by syringing

with an antiseptic, such as perchloride of mercury lotion, 1 in 1000, and afterwards instilling drops of rectified spirit, or painting with tincture of iodine till no more evidence of fungus can be found. Then, if soreness remains, a mercurial ointment, such as white precipitate, may be used. Occasionally the meatus is invaded by live insects, which may cause great discomfort. A few drops of chloroform on cotton-wool, placed in the meatus, followed by syringing with a warm solution of biniodide of mercury, 1 in 1000, generally gets rid of the trouble. A few drops of carbolic oil (5 per cent.), followed, after a quarter of an hour, by syringing with water, is also very efficacious.

Foreign Bodies in the Meatus. — These occur more frequently in children, and are introduced either by accident or perversity. Occasionally one finds a foreign body present on examination without the patient having been aware of its presence, but having come complaining of deafness or irritation in the ear.

Treatment.—Although a large variety of objects have at different times found their way into the auditory meatus, the vast majority of these can fortunately be removed by means of a syringe and water, and the guiding principle of treatment lies in removal without damaging the ear, remembering that brain abscess and death have resulted from inflammation following upon rough attempts at extraction. In the first place, careful inquiry and examination should be made as to the exact character and position of the foreign body, and it is a good plan to begin by instilling a few drops of a 20 per cent. solution of cocaine with adrenalin into the meatus. A common position for foreign bodies to lodge in is in the depression in the external meatus just external to the membrana tympani. Since some 90 per cent. of foreign bodies can be removed by careful syringing, except in the case of material likely to swell rapidly, this method should always be tried first, with, if necessary, the head in different

positions. If not successful, the method employed must depend on the nature and position of the foreign body. Remembering how in many instances foreign bodies have remained in the meatus for many years without causing damage, one must not forget that it may be, in some cases, better policy to leave them alone than to risk serious injury to the parts. For a round body which cannot well be seized with forceps, a fine blunt hook or loop may sometimes be wheedled between it and the meatal wall. If the patient is a child or a nervous adult, a general anæsthetic had better be given before proceeding to other measures if syringing is not successful. Sometimes the ingenuity of the surgeon is taxed to the uttermost: a magnet may be of use if the body be made of iron, suction has been used in some cases, and sticking on a thread or wooden spill with gum or seccotine in others. Only in very rare cases is it necessary to open the meatus from behind the ear by operation, but if suppuration is going on, this may be called for.

Myringitis is the term applied to inflammation of the membrana tympani, but this occurs in the vast majority of cases simply as a part of a middle-ear inflammation, and is included in that affection. The attempt to make an entity of this affection, apart from diseases of the external meatus on the one hand and middle ear on the other, is of but little practical value.

Rupture of the Membrana Tympani may be due to direct or indirect violence, the indirect forms being chiefly sudden loud noises, a blow on the ear compressing the air in the meatus, over-inflation, and any cause which suddenly makes the air pressure on the two sides of the drum very unequal. A closed Eustachian tube predisposes, and an atrophied or defective drum is obviously more easily ruptured than a normal one. Since these cases are very apt to lead to legal proceedings, when, for example, arising from a box on the ear, the surgeon, when called to such

an one, should be particularly careful to note all details connected with it. One must also remember that ruptured membrane is one of the complications of fractured base of the skull. The symptoms are chiefly sharp pain, followed by faintness, giddiness, and tinnitus, which latter are apt to remain for a considerable and indefinite period. There may be slight hæmorrhage from the meatus. The appearances vary greatly; the tear is generally in the lower part of the membrane, and may be irregular, oval, or as if a piece of the membrana tympani had been punched out. The symptoms of perforation, due to direct violence, may be similar, but the severity depends on the nature and size of the perforating body, and so also do the appearances presented by the tear in the membrane, which, on examination, is seen to have more or less blood about it. Perforations due to direct violence are most common in the posterior part of the membrane.

Treatment.—If seen early, before anything has been done, an expectant line of treatment is the best, *e.g.* closing the meatus with cotton-wool after the removal of any obvious foreign body.

If suppuration takes place, and this is much more common when due to direct violence, it must be treated in the same way as an ear suppurating from other causes.

Acute Inflammation of the Middle Ear is very commonly a complication or sequela of the exanthemata, especially scarlet fever and measles, also influenza and acute catarrh of the upper air passages, and is associated with adenoids, and may follow nasal douching, bathing, and operations on the nose. In syphilis, both hereditary and acquired, middle-ear suppuration is generally secondary to throat trouble. Sometimes an acute attack is superimposed on chronic inflammation. The *Streptococcus pyogenes* is probably the most common cause, but pneumococci and other cocci are not infrequently found, and appear to have a causal relationship.

Symptoms and Signs.—The onset of an attack is marked,

as a rule, by severe pain in the ear, and radiating from ~~it as~~ ^{its} a centre. It is of a throbbing character, keeping the patient awake at night. The pain is increased by such movements as coughing, yawning, and sneezing, and there is some tenderness on pressure in the angles between the mastoid process and the ascending ramus of the maxilla, and also behind the ear over the region of the antrum; in adults, shivering, with slight pyrexia, commonly occurs, but in children convulsions may commence the attack, and the temperature be raised to 103° or more. Hearing is more or less impaired and tinnitus complained of.

On examination, in the early stage, the most notable point is injection of the handle of the malleus. As the case proceeds, the colour of the membrane changes to dull red, and bulging takes place, this being most marked generally behind the handle; a yellow spot appears, and perforation takes place usually only in one spot, and if the meatus be gently cleaned out with cotton-wool, the aperture may be seen with pus exuding.

Various forms of acute otitis occur, *e.g.* a mild variety, in which restoration occurs without perforation, and a hæmorrhagic form, especially found in influenza, with discharge of blood; or the disease may concentrate itself in the attic, as shown by a red and bulging membrana flaccida above the short process of the malleus.

As regards prognosis, this largely depends on the severity of the attack, and there may be complete recovery of hearing and cessation of discharge; on the other hand, a severe attack, such as one gets in scarlet fever, may very rapidly permanently damage the hearing apparatus and leave a chronic discharge. The prognosis should be particularly guarded when the attic is affected.

Treatment.—This should at first be palliative; if the symptoms are at all severe, rest in bed and a calomel purge at night, with saline in the morning, ordered.

Hot applications are generally more soothing than cold,

and hot fomentations and sponging, combined with the instillation of drops of glycerine of carbolic acid; these have found more effective than those containing opium, opopon, belladonna, or menthol. Aspirin internally is sometimes useful. Bier's congestion treatment has apparently relieved acute otitis and mastoiditis.

If the symptoms are severe and the drum is reddened and bulging, especially when the inflammation seems concentrated on the postero-superior portion, paracentesis must be performed, a free incision being made behind the

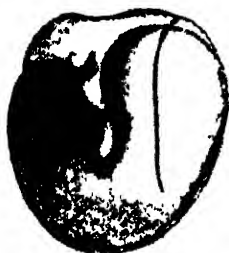


FIG. 77.—ACUTE OTITIS MEDIA SUPPURATIVA, BULGING BEHIND MALLEUS.

Showing line of incision.

handle of the malleus, or through the spot at which the abscess seems about to point. A short general anæsthesia will generally be necessary for this, as it is a decidedly painful operation, and it is most important that the patient should not move his head. Subsequently, whether the perforation is due to operation or is spontaneous, the ear must be syringed with boric lotion or perchloride of mercury, 1 in 4000, or sterile saline solution: about

three times a day will generally be sufficient. The frequency, however, varies; sometimes the discharge comes away very easily, at other times it is very viscid, and inclined to choke the opening. The meatus should be lightly plugged, after each syringing, with cotton-wool. Perforations due to incision are often difficult to keep open, whereas the spontaneous ones are often hard to close. Regular inflation must be practised directly pain has ceased and swelling subsided.

COMPLICATIONS.

These are very similar to those which occur in connection with chronic suppuration, and will be more fully described under that heading.

Facial paralysis may occur, but is generally much more marked when it occurs in chronic middle-ear suppuration. It should, however, always be looked out for by making the patient close his eyes and show his teeth: all degrees occur. **Mastoiditis** is indicated by extension of inflammation, with increase in constitutional symptoms, tenderness, swelling, and redness, these latter more especially in children, in whom extension to the surface is much easier. Pus generally comes to the surface over the base of the mastoid, pressing the auricle downwards, outwards, and forwards, or, more rarely, may pass down into the neck on the inner side of the mastoid process (Bezold's disease), or forwards to the root of the zygoma, or internally, to the labyrinth, or backwards or upwards to the interior of the skull. In rare cases mastoiditis may occur without any indication of previous middle-ear inflammation.

Treatment. — If the indications are slight one may temporise by seeing to it that the middle ear is draining properly, and using hot fomentations over the mastoid region or an ice-bag, rest in bed, and an aperient. Under this régime the inflammation sometimes aborts, but if this does not quickly take place, or the swelling increases, an incision must be made behind the ear, about a quarter of an inch from the attachment of the auricle to the skull and parallel to it. The antrum must be opened and drained, and all diseased bone removed.

Chronic Suppuration is one of the most common and most important affections of the middle ear. It is difficult to give an exact time as to where the line should be drawn between acute and chronic middle-ear suppuration. For convenience' sake it is well to make a rough division, and give the term "**chronic**" to one which has lasted over six weeks. There are numerous reasons why an acute suppuration, instead of healing, becomes chronic, *e.g.* general causes, such as anæmia, debility, together with local ones, such as

adenoids and other affections of the naso-pharynx, defective drainage, granulations, caries. Secondary infection, with other micro-organisms, is also doubtless a cause of chronicity in some cases, and so is bad treatment. On the other hand, the practitioner must always be on his guard, since an old chronic inflammation of years' standing may suddenly flare up, with rise of temperature, headache, and other symptoms of acute inflammation.

Symptoms.—Symptoms are more or less loss of hearing, more or less discharge, which, if slight, may only be revealed on mopping out the meatus with a cotton-wool swab, and which may be thin or thick, odourless or offensive. Tinnitus may occur, but it is not so common as in non-suppurative affections. Defective sense of taste, due to affection of the chorda tympani nerve, has been noted. Pain is a very variable symptom; it may be absent entirely, or there may be a history of attacks of pain, which however, pass off after a time. Vertigo is an important but variable symptom. Not infrequently, in reply to inquiries, the patient states that he is only giddy when the ear is syringed.

On examination, after cleaning out the meatus with cotton-wool swabs, or, if necessary, syringing with boracic lotion and drying with wool, perforations, not always easy to see, must be sought. These are generally, but not always, single, and may be of any size, from that of a mere pinhole to nearly the whole of the membrana tympani. A small hole is sometimes identified by the drop of fluid occupying it, giving a pulsating reflex of light, or pus may be sucked out by means of a Siegle's speculum. Perforation high up posteriorly is a bad omen, and indicates suppuration in the attic, and probable involvement of the head of the malleus and incus. The remains of the membrana tympani look whitish and sodden, the inner wall being more or less exposed, according to the size of the perforation. Granulations may perhaps be seen, and polypi, which, however, if of

any size, block the meatus, preventing any of the deeper parts being seen. The malleus may have been preserved or partly destroyed, only the stump remaining.

Treatment.—This consists of cleaning out the suppurating cavity as thoroughly as possible. Syringing is objected to by some, but in many cases the ear cannot be properly cleansed without. A good routine treatment is as follows: Instil a few drops of hydrogen peroxide (6 vols.); wait three minutes, and syringe with warm, sterile, boric lotion, 10 grains to the ounce; dry with cotton-wool, and instil 5 drops of spirit (vini. rect.), beginning with a 50 per cent. solution and gradually increasing the strength to pure spirit if necessary; wait three minutes, and dry again with cotton-wool. A change of lotion is sometimes effective—hydrarg. perchlor. 1 in 5000, or hydrarg. biniodide 1 in 4000, or formalin 1 in 500 may be tried, or izal. If the perforation is large, low down, and discharge slight, insufflation of powdered boric acid, after first cleansing and drying, is often very effective. It should, however, only be used in a sufficient quantity to form a thin coating to deeper parts. Something more may be required, however, if granulations or polypi have formed, such as cauterisation with a little pure chromic acid carefully applied on a probe, or nitrate of silver used in the same way; polypi must be removed, and a short general anæsthesia is usually necessary for this purpose. Failing a general anæsthetic, a few drops of 20 per cent. cocaine solution should be instilled into the meatus, and the head kept in such a position for ten minutes as to allow the drops to penetrate deeply. Previous to this the meatus should be well cleansed with cotton-wool swabs. The loop of a fine wire aural snare is slipped over the polypus, as far as it will go, and is then tightened up and withdrawn, bringing with it the growth. Some surgeons prefer a small ring knife, which is as equally effective as the snare. The meatus should now be cleansed with swabs and packed lightly with sterile

gauze. Sometimes fetid discharge exudes from behind the polypi when removed, and must be cleaned out. On packing the meatus with ribbon gauze the hæmorrhage soon ceases.

Facial Paralysis.—This occurs as a complication to both chronic and acute median otitis, but is generally of a more serious and persistent nature when associated with chronic, and is frequently met with in tubercular and malignant disease. It must, as a rule, be taken as an indication for operation, generally a radical mastoid. It may, however, be associated with tight packing after operation, and varies greatly in degree and duration. In old cases contracture of muscles takes place, and the doctor may, if not careful, be deceived as to the side of the paralysis. As the results are disfiguring, the surgeon is sure to be asked as to prognosis, which must be very guarded, but is best in acute and incomplete cases.

Post-operative cases often recover after periods varying from weeks to months.

Treatment.—This should be faradism and massage to the affected muscles. In some cases, no improvement having taken place after many months, good results have followed from exposing the ends of the nerve and freeing them; in others, by joining the peripheral end of the divided facial to the hypoglossal nerve.

Caries and Necrosis are more common in chronic than in acute suppuration, although they may not infrequently occur associated with the fevers, such as scarlet. Any portion or extent of the bone may be attacked, but that most commonly invaded is the postero-superior portion of the external meatus and the mastoid process. Of the small bones, that most often affected is the incus. Generally, persistence of discharge, which is often offensive, thick, and yellow, but may be thin, and the presence of pain, lead to careful examination with the probe, which reveals the presence of bare bone. A



FIG. 78.—POLYPUS PROTRUDING FROM EXTERNAL AUDITORY MEATUS.



FIG. 78A.—POLYPUS AURIS.

suspicious symptom also is the presence of large granulations, especially if recurring after cauterisation.

Treatment.—If the signs and symptoms are slight, and especially if thorough cleansing treatment has not been carried out, the surgeon may be justified in temporising with antiseptic drops, and cauterising granulations, but generally it will be sounder practice to perform the radical operation, or, in exceptional cases, some modification of it. Ossiculectomy, *i.e.* the removal of the malleus and incus, has gone largely out of fashion, for in performing it the surgeon is, to a large extent, working in the dark. The malleus is easy to remove, but the incus is more deeply placed, and is therefore more difficult. The operation is not without danger, and I have seen a case in which intracranial complications and a fatal result followed this operation, and in other cases facial paralysis has occurred; also, the removal of the ossicles is by no means certain to cure the disease, and this procedure has also very little advantage over the radical mastoid operation in the way of preserving the hearing.

A **Cholesteatoma** consists essentially of a mass of squamous epithelial cells, more or less concentrically arranged, and is, in the vast majority of cases, associated with, and secondary to, chronic middle-ear suppuration; but in rare instances no history of suppuration exists, and it is considered a primary condition. As regards etiology, the view has been held that in secondary cases the epithelium has grown in from the meatus through a perforation in the membrana tympani. A cholesteatoma may appear as a smooth, glistening body, and exhibit cholesterol crystals on examination, or as a yellowish, putty-like mass, with an offensive odour, the masses of epithelium tending to undergo fatty degeneration and decomposition. A very notable point about this disease is the amount of absorption of bone which may occur, due to the action of the cholesteatoma, so that the temporal, and even other cranial bones, may be hollowed out

with the formation of large cavities. These cavities may be covered by a kind of false membrane in parts, but in others the bone is bare and rough.

Diagnosis is not always easy, the symptoms being often obscure, and some cases are doubtful in nature until the parts have been exposed by operation, but in other instances



FIG. 79.—RIGHT MASTOID ABSCESS SHOWING DISPLACEMENT OF THE EAR.

(The parts have been shaved.)

it may be made by the discharge through a perforation in the membrana tympani of soft, yellowish-white material, found on examination to consist of masses of epithelium.

Treatment.—A radical mastoid operation and complete removal of the mass is generally required for this condition. A cholesteatoma may remain quiescent for years, but the position is a dangerous one. Short of operation, keeping the ear as aseptic as possible with spirit and peroxide of hydrogen

drops is the best treatment. Syringing with watery solutions should be avoided as much as possible, as it tends to make the mass swell up and penetrate the tissues.

Fistulæ are sometimes found in the meatus or behind the ear, due to, and left after, the discharge of an abscess. A fine probe passed down generally strikes bare bone. Sometimes something may be done in these cases by curetting,



FIG. 80.—PREPARATION ILLUSTRATING IMPORTANT RELATIONS IN THE MASTOID AND ADJACENT REGIONS (RIGHT TEMPORAL BONE).

1. Temporo-maxillary articulation.
2. Membrana tympani.
3. Canal for facial nerve, opened, bony meatus cut away.

but generally an external operation—with the opening up of the parts behind the ear—will be necessary.

Inflammation of the Mastoid Process.—Although to a certain extent the antrum may be said to be involved in every acute suppuration of the middle ear, yet this does not necessarily affect the mastoid cells and periosteum. If these are attacked, one gets a rise of temperature and pulse-rate and increase of pain over the region of the mastoid. If the pus comes to the surface, one gets marked swelling, oedema,



FIG. 81.—PREPARATION ILLUSTRATING IMPORTANT RELATIONS IN THE MASTOID AND ADJACENT REGIONS.

Antero-posterior vertical section of right temporal bone seen from inside.

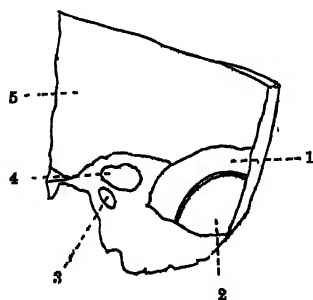


FIG. 81A.

- | | |
|-------------------------------|---------------------------------------|
| 1. Groove for lateral sinus. | 4. Antrum. |
| 2. Depression for cerebellum. | 5. Grooves for cerebral convolutions. |
| 3. External auditory meatus. | |

often associated with a somewhat typical displacement of the ear, best observable from behind: the auricle standing out from the side of the head, and being displaced downwards and forwards (p. 212). Sometimes, however, the inflammation and the pain are of a more deeply seated character, and the pus, taking a different course, may discharge either into the external auditory meatus, middle or posterior fossa of the skull, internal ear, or digastric fossa (Bezold's disease).

The symptoms sometimes are masked, the patient complaining of very little discomfort, swelling behind the ear being discovered almost accidentally by the surgeon or patient.

It is also well to remember the presence of the mastoid



FIG. 82.—PREPARATION ILLUSTRATING IMPORTANT RELATIONS IN THE MASTOID AND ADJACENT REGIONS.

Antero-posterior vertical section of the right temporal bone viewed from inside (rather internal to Fig. 81).

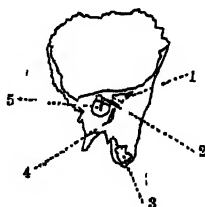


FIG. 82A.

1. Antrum.
2. External semicircular canal.
3. Large cell in the tip of the mastoid process.
4. Canal for facial nerve, opened.
5. Membrana tympani.

lymphatic gland, the swelling and inflammation of which are



FIG. 83.—PREPARATION ILLUSTRATING IMPORTANT RELATIONS. TRANSVERSE VERTICAL SECTION OF THE RIGHT TEMPORAL BONE IN THE REGION OF THE EXTERNAL AND INTERNAL AUDITORY MEATUSES.

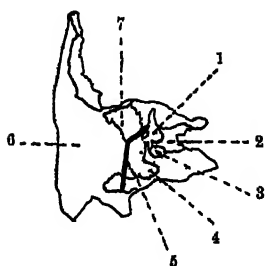


FIG. 83A.

1. Vestibule.
2. Internal auditory meatus.
3. First turn of the cochlea.
4. Tympanic cavity.
5. Facial canal, opened up.
6. External auditory meatus.
7. Antrum.

sometimes confused with mastoid disease. Diagnosis is generally easy in mastoid and periosteal inflammation, but in doubtful cases leucocyte counts should be made, and X-ray photographs may occasionally help; but these are not easy of interpretation, especially as asymmetry here is common.

Treatment.—When it is doubtful whether suppuration is actually taking place, and there is no evidence of intracranial complication, mild measures may be tried. After putting the patient to bed, see that free discharge can take place from the middle ear, doing a paracentesis if necessary, and apply hot fomentations or an ice-bag to the mastoid region, whichever seems to give most relief. Leeches to the mastoid, formerly much in vogue, are but little used now. Bier's treatment has been recommended by some, but, personally, I cannot advise it. Internally, calomel, 2 to 4 grains, followed by a saline aperient

in the morning, is useful. If the inflammation does not



FIG. 84.—PREPARATION ILLUSTRATING IMPORTANT RELATIONS IN THE MASTOID AND ADJACENT REGIONS.

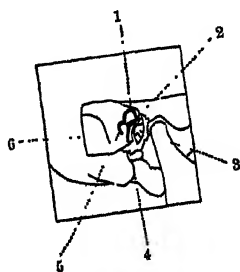


FIG. 84A.

1. Superior semicircular canal.
2. External semicircular canal.
3. External auditory meatus.
4. Facial canal, opened up.
5. Posterior semicircular canal.
6. Convexity corresponding to groove for lateral sinus.

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subside, say within 48 hours, or intracranial or internal-ear complications threaten, operation must at once be undertaken: and the rule should be, "If in doubt, operate."



FIG. 85.—PREPARATION ILLUSTRATING PARTS EXPOSED IN THE RADICAL MASTOID OPERATION (right side).

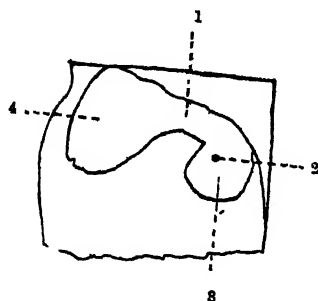


FIG. 85A.

1. Aditus.

2. Head of stapes and above it the attic.

3. Tympanic cavity.

4. Antrum.

Operations on the Mastoid Process.—There are two chief operations. Speaking generally, the operation on the antrum

(1) is that performed when the mastoid is involved in the case of *acute* middle-ear suppuration, whereas the *radical* (2) is that generally employed when necessity arises, in the case of *chronic* suppuration.

1. Consists in opening the antrum and removing any diseased bone found, and draining: some operators, however, close the wound.

2. *The radical operation.*—The operation to be performed when certain conditions arise, the chief of which are—mastoid abscess, recurrent attacks of suppuration associated with giddiness and pain, facial paralysis, mastoid fistulæ, cholesteatoma, necrosis of the temporal bone, and as a first step in certain cases in which signs of intracranial complications are beginning to occur. In the radical operation, an incision having been made behind the ear, and the soft parts having been reflected, the bone is removed until the external meatus, attic, and antrum are thrown into one large cavity; the remains of the malleus and incus are also removed, and such portion of the mastoid cells as may seem necessary. Flaps may be made from the cartilaginous meatus or this may be partly cut away; immediate or subsequent, skin grafting of the cavity is practised by some, to promote rapid healing. In certain cases it is possible to do a somewhat less extensive operation. In the radical operation the parts most liable to be damaged, and to be carefully avoided, are—the lateral sinus behind, and the middle fossa above, both of which obtrude themselves to a very variable extent in different cases on the field of operation; and the facial nerve running backwards and turning downwards in the floor of the aditus, also the external semi-circular canal lying just above the facial nerve. The period of time which elapses before the parts are quite healed varies enormously; it may be weeks, it may be months.

INTRACRANIAL COMPLICATIONS.

It should be said, in the first place, that, although it is convenient to describe these separately, they may be present at the same time, and the symptoms overlapping, an exact diagnosis may be rendered very difficult.

I. EXTRADURAL ABSCESS.

The symptoms are not very clear, but deep-seated pain may be present, and in some cases large quantities of pus may be discharged from the middle ear, or may be sucked out by means of a Siegle's speculum, pointing strongly to this condition.

Treatment consists in removal of surrounding bone and drainage of the abscess.

II. LEPTOMENINGITIS, OR INFLAMMATION OF THE INNER MEMBRANES OF THE BRAIN.

This is generally a more or less general affection of the meninges, but may be either localised or diffuse, and may be serous or purulent, and acute or chronic. In most cases, however, it is general and acute, passing on from serous to purulent. The infection may take place in various ways, such as through the route of the middle ear or antrum, along the sheath of the vessels, or through the internal auditory meatus by way of the labyrinth, or directly through defects in the bone. The more important organism found is the *Streptococcus pyogenes*.

Symptoms come on gradually. Headache is an early one, at first local or posterior, but becoming severe and general. The patient lies on his side and tends to assume a flexed position; he is irritable, and avoids light and all interference. The muscles at the back of the neck are rigid. The pupils are small and sluggish to light, and optic neuritis is often present. Vomiting is common; the bowels are constipated. The patient, if a child, often screams and cries, and may have

convulsions. The temperature is high— 104° to 106° ; knee-jerks absent. Kernig's sign is generally present. Pulse is hard and rapid. As the disease progresses, paralytic symptoms develop, and the pulse weakens and becomes irregular; the breathing becomes embarrassed, and the patient comatose. A further rise in temperature may take place before death. Cranial nerves, especially the third, sixth, seventh, and eighth, are often affected. The disease is generally fatal, though not invariably so.

Treatment.—Except as regards the treatment of symptoms, this is surgical. When meningitis is suspected a lumbar puncture must be made, and the result noted.

Considering the importance of this operation in this affection, it will be well to examine the results obtained somewhat in detail. When it is performed at an early stage of meningitis, we note the following:

1. Cerebro-spinal fluid escapes under pressure.
2. The fluid is clear, or nearly so.
3. The specific gravity is 1001 to 1005.
4. It is alkaline in reaction.
5. Contains but few lymphocytes and polymorpho-nuclear leucocytes.
6. It reduces Fehling's solution.
7. Bacteria are not found in films.

As the case becomes worse, bacterial invasion advances, and purulent meningitis comes on.

1. The fluid becomes turbid.
2. The fluid becomes less alkaline or acid.
3. There is great increase in white cells, particularly polymorpho-nuclears.
4. It fails to reduce Fehling's solution.
5. Bacteria are found in the films and cultures.

Prognosis is bad, particularly if the organism present is

a streptococcus; but some cases do recover, and it seems likely that the percentage of deaths would be lower if an early operation could be performed.

Treatment.—Reduce intracranial tension by lumbar puncture, and remove the infecting focus. If this is not sufficient, draining the subarachnoid space, either by way of the internal auditory meatus or trephining the skull in one or more places in the middle or posterior fossa, and incising or removing the subjacent dura mater. Tapping and draining the ventricles has been tried, but has not, so far, met with success. Vaccine therapy should be tried.

III. BRAIN ABSCESS.

In the vast majority of cases these are situated in either the temporo-sphenoidal lobe or in the cerebellum, the former being the more common situation, and one notes that it is just above or just behind those portions of the middle ear from whence the trouble originates. These abscesses are generally single, more common in young persons, and as a complication of chronic middle-ear suppuration. Of course if the case has become one of pyæmia multiple abscesses in the brain and other parts of the body, *e.g.* lungs, may occur. The symptoms at first are apt to be indefinite. The patient, who has probably long suffered from discharge, complains of headache, feverishness, and perhaps has a rigor. He may have had mastoiditis, and a radical operation have been performed for this; but though the temperature goes down, and the discharge may stop, he does not feel well, but rather worse in himself, the temperature becoming subnormal, and the pulse slow and laboured. Headache continues, and a lethargic condition comes on. Nausea, independent of food, is present, and vomiting may occur. Obstinate constipation is present, the patient markedly wasting and weakening. The tongue is furred, and the breath peculiarly offensive, having an odour of putrefaction.

On examination, optic neuritis may be found. As the case progresses, the patient becomes more and more comatose, respiratory difficulty arises, and he dies. The before-mentioned signs, however, though they point to an abscess, do not locate it, and for help in this direction we note, as suggestive of **temporo-sphenoidal abscess**, paralysis of the third nerve with ptosis, and dilated pupil on the same side, and crossed facial paralysis. If the affection is on the left side, speech is more or less affected, and difficulty in naming objects is sometimes present. If the pressure is superficial, we may get, in the following order, facial, arm, and leg paralysis on the opposite side, but if the pressure is deep on the internal capsule, the order is, first leg, then arm, and then face, and sensation is also affected.

As might be supposed, the signs vary with the size of the abscess and the direction of the pressure. As suggestive of **cerebellar abscess** may be noted marked giddiness, the patient feeling as though he were falling out of bed, slow nystagmus to the affected side, weakness of the conjugate movements to the affected side, and skew deviation of the eyes. Paralysis of the sixth nerve, difficulty in co-ordination, as shown by failure of the patient to touch the tip of his nose with his finger, and inco-ordination as regards gait, if the patient be sufficiently well to walk. Also in attempting regular complex movements, as in straightening the lower limbs when lying down, and during rapid supination and pronation of the forearm on the same side; also weakness and flaccidity of muscles on the same side of the body, the face not being affected.

As soon as abscess of the brain has been diagnosed, operation for its evacuation should be undertaken. This is particularly so in cerebellar abscess, as in this form sudden death is common. The dura mater having been exposed, either above or through the roof of the middle ear and antrum, if temporo-sphenoidal abscess is suspected—and in

front or behind the lateral sinus in the case of the cerebellum, as may seem best in each individual case—is incised, the pus-seeker or sinus-forceps introduced into the brain, and the abscess opened and drained. Under this treatment many cases recover.

IV. INFECTION OF THE VENOUS SINUSES.

The lateral is that most commonly affected, but from thence inflammation may spread to the petrosal and cavernous sinuses, or downwards into the bulb and jugular vein, or to the torcular. It is a common complication of both chronic and acute suppurative disease of the ear, the infection passing back through the bones and walls of the sinus, and thence to the blood stream, causing phlebitis and thrombosis. If the process goes on, the clot may break down and be carried away and set up septic foci in other parts of the body.

Symptoms—In some cases the lateral sinus is unexpectedly found to be affected during operation, when the symptoms were slight and indefinite, but, as a rule, one or more very significant rigors occur, with rapid rise of temperature, followed by a fall, with marked sweating. Any discharge there may have been from the ear now generally ceases. Headache, vomiting, and optic neuritis are often present, and if the infection spreads downwards, fulness and tenderness along the upper part of the internal jugular in the neck, and swelling of the glands in this region is noticeable, also cedema at the back of the mastoid process from thrombosis of the mastoid vein has been met with. If, on the other hand, it spreads up into the cavernous sinus, protrusion of the eyeball and ophthalmoplegia are liable to occur.

Treatment.—Operative interference is at once urgently needed if the diagnosis of lateral sinus thrombosis has been made.

The sinus having been exposed after opening the antrum,

(if this has not already been done), and extending the wound backwards, it should be examined with the finger and a hypodermic needle. If a clot be present, the sinus should be freely opened, cleared, and plugged. Opinions differ as to whether the jugular vein should always be tied, but this seems clearly to be the safest plan in doubtful cases, and those in which the thrombus extends into the neck.

When operating for lateral sinus thrombosis, it is not uncommon to come across a collection of pus between the dura mater and the bone, to which the term extradural abscess is applied, and this may also occur in the middle fossa on the superior surface of the temporal bone. These abscesses, unless large enough to cause compression, do not give rise to very definite symptoms, but, when found, must be effectively drained.

Y. ACUTE LABYRINTHITIS.

(See p. 234.)

TUBERCULAR DISEASE.

This is more common than was formerly believed, and occurs most frequently in children. It may be either primary or secondary to tuberculous disease in the lungs and other parts. It is generally characterised by—

1. Insidious onset, with but little pain, and fetid watery discharge.
2. Multiple perforations of the membrana tympani.
3. Enlarged cervical glands.
4. Early facial paralysis.
5. Extensive bone disease and formation of sequestra.

Tubercle bacilli are difficult to find in the discharge, but sections of granulation tissue may show them, or inoculation experiments on guinea-pigs may be tried. Tubercular disease may be of sudden onset, but it is often very difficult to get a satisfactory history as to its date of origin, and it is better known as a chronic affection. On operation, one finds

very often the extent of bone disease is very much greater than was previously expected. One must remember, however, that although often associated with tubercular disease in other parts, such as the lungs, disease of the ear in a tubercular subject is not necessarily itself tubercular.

Treatment.—Besides the general treatment found useful



FIG. 86.—TUBERCULAR DISEASE OF THE MIDDLE EAR AND MASTOID REGION IN A BOY AGED 8. OPERATED ON FOUR TIMES, FIRST OPERATION AT THE AGE OF 6 MONTHS.

in tuberculosis, free removal of diseased tissues is indicated, after which the parts will generally heal well, but are very likely to break down again after a time, the disease only being eradicated after repeated operations. In one case under my treatment, marked improvement appeared to be due to tuberculin injections, but in other cases this form of treatment has been very disappointing.

MALIGNANT DISEASE.

Both carcinoma and sarcoma occur; the former is more common and is found particularly in elderly people. In these cases, severe pain, foetid discharge from the ear are apt to occur, and early facial paralysis, associated with granulations, which rapidly recur after removal. These signs and symptoms should give rise to suspicion of malignancy, and the granulation tissue should be microscopically examined. The glands in the neck may or may not be enlarged.

Operation will generally give temporary relief, but the chances of cure are in most cases but slight. Radium should certainly be tried.

MIDDLE-EAR CATARRH.

This may be acute or chronic.

Acute is commonly caused by the extension of inflammation along the Eustachian tube from the naso-pharynx, where it has been set up by influenza, a common cold, the exanthemata, or gout, operations on the nose, and adenoids. Pain is not often present to any extent, but the patient feels fulness and pressure in the ear affected. A variable amount of deafness is complained of, which sometimes suddenly disappears, often to return again. The patient's own voice may seem very loud to him. Tinnitus is generally present. The membrane often does not show much change, but may be glistening, and of a peculiar yellowish colour, and the manubrium prominent. In certain cases a considerable collection of fluid takes place in the middle ear, and if the membrana tympani is sufficiently transparent, it is possible to see the liquid through it, the upper limit being marked by a line which, if the exudate is not too viscid, alters with the position of the head, and bubbles may be seen on inflation.

The diagnosis is made from the history and appearances, and in addition Rinne's test is negative, and in Weber's the

sound of the tuning-fork is referred to the deafer ear. Inflation, in an uncomplicated case, at once restores the hearing, and under these circumstances prognosis is good, but there is a tendency to recurrence and chronicity. Much depends on whether the cause can be removed.

Treatment.—The first thing to do is to open the Eustachian tube by means of politzerisation or the catheter, and so get rid of the exudation, and this may be assisted by hot fomentations, massage, or blistering applied to the mastoid process. In obstinate cases rarely it may be necessary to incise the membrane at its most prominent part, and drive out the fluid by Politzer's bag, or suck it out by the Siegle's speculum; but great care must be taken in the way of asepsis, as there is a distinct risk of setting up suppuration in these cases.

Chronic Catarrh of the Middle Ear and Eustachian Tube is due to a number of causes amongst which some of the most important are repeated attacks of acute middle-ear catarrh, extension of post-nasal catarrh, adenoids, general diseases, such as rheumatism and gout, paralysis of the muscles of the palate, such as results from diphtheria; pregnancy and the puerperal stage, exposure to dust and cold, bad air, excessive use of alcohol and tobacco. The disease is commonest at and after middle life, and generally affects both ears, though one is commonly more affected than the other. The membrana tympani becomes retracted and thickened in some parts and atrophied in others. Opaque spots and calcareous deposits may occur. The handle of the malleus is retracted, the short process is prominent, and the posterior fold well marked. Meanwhile, adhesive processes go on in the middle ear, which affect particularly the articulation of the ossicles and the fenestræ, and form adhesions between the promontory and the membrana tympani. More or less deafness is always present, but is very variable in degree. Noises are much better heard than conversation. Damp and fatigue make the hearing much worse. Sometimes the patient hears better

in a noise (**paracusis Willisii**), but this is by no means a constant symptom. Tinnitus may be very troublesome. Pain is uncommon, but hyperæsthesia to noises may be present. The Eustachian catheter often reveals narrowing of the tube, and whistling and squeaking sounds result on inflation; and if the ear be examined after this has been done, or the Siegle's speculum been used, the adherent parts and the atrophied or relaxed portions of the drum become manifest. On testing with the tuning-fork, Rinné is found to be negative, bone conduction lengthened, high notes are well heard, but the lower ones defective. As the case progresses, however, a certain amount of involvement of the internal ear may take place, and the tests give different results, the bone conduction being shortened and the high notes not heard so well.

In making the diagnosis, the history, the appearance of the membrane, the results of inflation help us to diagnose this affection from oto-sclerosis, with which it is most likely to be confounded, though, unfortunately for the diagnostician, mixed cases occur.

CHRONIC CATARRH.	OTO-SCLEROSIS.
1. A disease of the mucous membrane.	A disease of the bony labyrinthine capsule.
2. Evidently associated with catarrh.	Unconnected with catarrhal symptoms.
3. Membrana tympani much altered—thickened, or atrophied, and retracted.	Membrana tympani normal, or appears slightly reddened, due to congestion of underlying promontory.
4. Eustachian tube often narrowed.	Eustachian tube patent.
5. Paracusis sometimes present.	Almost invariably present.
6. Tinnitus common.	A most frequent, early, and troublesome symptom.
7. Inflation—some improvement.	Inflation—no improvement.

The *prognosis* must be guarded, and depends largely on what improvement can be obtained by inflation. It is, however, better than in oto-sclerosis.

Treatment.—Avoidance of all possible sources of catarrh, such as dust, tobacco, alcohol, and exposure. A thorough trial of inflation by Politzer bag or catheter should be made, employing one or other method, say three times a week, for four weeks; and this may be supplemented by the Eustachian bougie if the canal appears blocked, and an attempt at mobilisation of the ossicles by means of pressure on the malleus with Lucae's probe has been recommended. Numerous other therapeutic measures, *via* the Eustachian tube, have also been tried, including hot-air inflation, aerial massage, injections of iodide of potassium and bicarbonate of soda, and mercurial preparations per tubam, also fibrolysin. These have all had their advocates, but a more prolonged trial has not given the satisfactory results at first anticipated. The general health must be treated. A high-lying and dry district is more to be recommended than the seaside. Operative treatment on the membrane, ossicles, and muscles of the middle ear, after extensive trial, has fallen almost entirely into disuse.

OTO-SCLEROSIS.

Oto-sclerosis is a disease of the bony capsule of the labyrinth, consisting in the absorption of bone on the one hand, and deposition of spongy bone on the other, an important result being in many cases immovable fixation of the stapes in the oval window.

This disease is more common in women than men, and a hereditary tendency seems marked in some cases, and under these circumstances the affection may commence in youth. It generally begins in persons between twenty and thirty years of age. It often becomes marked during pregnancy and the puerperal period, and has been associated with gout, syphilis, ozæna, and anæmia. It generally begins in one ear. Tinnitus is a very early and markedly troublesome symptom. Paracusis Willisii is very constant. The tuning-fork shows

Rinné negative, lengthening of bone conduction, and Weber referred to the deafer ear. Lower notes are badly heard, while upper ones are well heard. A certain amount of pain in the ear, which comes and goes, is common. On examination, the membrana tympani is generally normal, and the Eustachian tube patent.

Treatment.—This is very unsatisfactory. Occasionally the disease appears to cease to advance, and even to recede somewhat of itself. Operative treatment cannot be recommended—in fact, it generally makes things worse. Cases in which improvement can be obtained by inflation are those in which the affection is mixed with catarrhal deafness. It is, however, as well to try it, and see if any improvement can be effected. Such drugs, however, as arsenic, phosphorus, and iodide of iron may be tried, and bromide of potassium, hydrobromic acid, and strychnine, also oto-massage for the relief of the tinnitus.

INTERNAL-EAR DISEASES.

It must be noted, in considering these affections, that this organ consists of two parts, namely, the cochlear portion and the vestibular part. These may be affected singly or together; the main symptoms of the cochlear affection being deafness and tinnitus; those of the vestibular, giddiness, nystagmus, and sickness.

As regards etiology, congenital defects of the internal ear and auditory nerve occur, but are rare, and, on the other hand, senile degenerative changes, with loss of hearing, take place late in life. Syphilis may attack the internal ear, both in—(1) The hereditary form, which generally comes on in adolescence, and often just when the patient is recovering from interstitial keratitis, one ear after the other becoming rapidly deaf, the prognosis being bad; and (2) acquired. This may occur either in the secondary stage, when it is generally bilateral and transient, being apparently of the

nature of an inflammatory condition, or in the tertiary stage, when it is very chronic, and more of a degeneration.

A number of cases are recorded which seem to point to Salvarsan as a cause of internal-ear mischief, but it is very difficult to say whether the syphilis or the remedy were the cause. At any rate, it seems advisable to avoid this particular form of treatment in cases in which the hearing is already defective.

Cerebro-spinal meningitis and mumps are exceedingly important causes of internal-ear disease; occurring, as they generally do, in the young, the child is very apt to become a deaf-mute.

Amongst other general diseases, those which most commonly affect the internal ear are leukæmia, anæmia, malaria, the exanthemata, especially typhoid fever and gout. Extension of suppurative or non-suppurative disease from the middle ear, which is apt to occur as the affection advances, is another important cause; also a primary inflammation of the labyrinth has been described in which the patient is attacked with vomiting, fever, convulsions, giddiness, and deafness. Injury, such as fractured base of the skull, is responsible for some cases of internal-ear and nerve deafness, and new growths for others. Drugs, such as quinine and salicylates and antipyrin, sometimes produce defective hearing of this type, and tobacco in excess has been thought by some to produce a similar affection in the auditory, as it may in the optic nerve. In cases of internal-ear deafness, one gets, on testing, the following results:

1. Marked diminution of hearing power for speech.
2. Marked diminution of bone conduction.
3. Marked loss of high tones by aerial conduction.
4. Rinne's test—positive.
5. Weber—referred to the better ear.

When mixed with other kinds of aural disease these results, however, will be more or less masked.

Treatment.—This varies with the cause; *e.g.* specific cases require active antisyphilitic treatment, such as mercurial inunction, with iodide of potassium internally.

Prognosis is very bad, speaking generally, as to recovery of hearing, excepting those which occur in the secondary stage, which not infrequently recover. In cases in which suppuration has extended into the internal ear operation will be urgently needed. In other cases, where the onset of symptoms has been rapid, rest, calomel purge, followed by a saline, ice to the head, low diet, and bromide of potassium should be administered. Later on, injections of pilocarpin may be tried, with blistering over the mastoid process.

MENIÈRE'S DISEASE.

A term applied to a group of symptoms first pointed out by Menière, and the original case was found post-mortem to have suffered from hæmorrhage into the labyrinth. The essential pathology, however, has been much disputed. The affection is generally unilateral, but may be bilateral. The chief symptoms are sudden and extreme deafness, giddiness, and vomiting, also loud tinnitus, great pallor, and sweating. Loss of consciousness has also been described in rare cases, and nystagmus. Of these symptoms, the first to disappear is the vomiting, and next the giddiness. Also the tinnitus tends to abate, but the deafness remains more or less permanent.

On examination, the membrana tympani appears normal, while tuning-fork tests point to an internal-ear affection.

Extreme heat, leukæmia, and pernicious anæmia have been suspected as causes in different cases. The affection may come on in a person who has never complained of his ears, or it may be superimposed on chronic disease of the middle ear. Some confusion, unfortunately, has arisen owing to the term Menière's disease having been applied, not only to the acute affection above described, but also to much milder and more chronic cases, in which the patient suffers

from vertigo, nausea, deafness, and tinnitus, and which would be better described as suffering from Menière's symptoms than Menière's disease.

Treatment.—In the acute apoplectic form the patient must be placed in bed with cold to the head. Low diet must be ordered, and stimulants strictly forbidden. In the later stages, and in mild cases, pilocarpin may be given either internally or by subcutaneous injection, and iodide of potassium, combined with blistering behind the ears.

Non-suppurative disease of the labyrinth. with very marked tinnitus or giddiness, sufficient to make life unbearable, has recently been successfully dealt with by operation on the internal ear, planned to destroy the cochlea and semicircular canals.

ACUTE LABYRINTHITIS.

Acute labyrinthitis as an entity has been described in which the patient, after a feverish attack, with convulsions or coma and vomiting, is found to be very deaf and giddy, the latter passing off, the former remaining. Many, however, believe that this affection is really cerebro-spinal meningitis. It may also occur by extension in middle-ear suppuration.

Treatment.—As in Menière disease; opening up and draining may, however, be necessary in suppurative cases.

TRAUMATISM.

The labyrinth may be damaged by direct injury, such as a stab, producing deafness, giddiness and vomiting, often also the facial nerve is damaged.

Treatment.—This must not be meddlesome. With the exception of removing any foreign body and plugging with cotton-wool or gauze, it had better be expectant. Complete rest in bed is desirable. Concussion and fractured skull, involving the labyrinth, may also result from blows—in the

former the deafness generally being temporary, and in the latter permanent.

HYSTERICAL DEAFNESS.

This may be easy or very difficult of diagnosis, especially when a certain amount of organic disease is known to be present. In a typical case the patient—a woman—becomes suddenly deaf, more often in one ear only, which, on examination, shows no obvious change to account for it. Tinnitus and giddiness are not present. There may be anæsthetic areas in other parts of the body, or aphonia, or a history of hysterical attacks. Tuning-forks do not give results consistent with those obtained in any of the ordinary forms of deafness, and, what is most important, the results vary largely on different occasions when tried.

Treatment.—It should be suggested to the patient that she will without doubt get her hearing back, and very likely it will return suddenly. Hypnotism has been found useful in some cases, and galvanism, one electrode being placed in contact with the external ear in the region of the meatus, the other being held in the patient's hand. Internally, the ammoniated tincture of valerian or the valerianate of zinc are most likely to prove useful.

FEIGNED DEAFNESS.

The surgeon may have to examine persons suspected of malingering, and a number of tests have been planned to detect simulation. As regards cases in which only one ear is said to be deaf—

FIRST TEST.—Blindfold the patient, and closing the good ear, test repeatedly in the ordinary way with a loud watch or acoumeter, when very varying results will be obtained on different occasions, if the patient admits hearing at all.

SECOND TEST.—Two ear-trumpets are placed one in each ear of the patient, and an examiner whispers to him through each, and he is told to repeat what is said. If he hears in both, he soon becomes confused, mixing the one with the other.

THIRD TEST.—A binaural stethoscope has one limb carefully blocked up, and this end is placed in the patient's good ear. If he hears the voice, on the surgeon's whispering through it, malingering will be suspected.

FOURTH TEST.—The aural conduction of a tuning-fork (C2) is tested for each ear and the distance noted at which it can be heard. It is then placed on the vertex, when, if middle-ear deafness be present, the patient will refer the sound to the deaf ear, but the simulator to the good ear. If now the good ear be stopped up, the simulator will allege that he does not hear it at all.

Total deafness is difficult to be certain of, but the person should be tested with loud sounds when he is asleep, also calling his name suddenly from behind and watching his face. He may also be put through the caloric and rotatory tests, when, if he be totally deaf, the normal reactions will not take place; or he may be put under an anæsthetic and spoken to loudly on coming round, and so caught off his guard.

Toxic Causes.—Quinine and salicylates are the most common, and produce deafness of the internal-ear type, with tinnitus and vertigo. Where the drug has been taken for a long period in large doses the prognosis must be guarded, particularly as it may be impossible to say how much of the disease is malarial; also tobacco, alcohol, Salvarsan, lead, phosphorus, carbon-monoxide, chloroform, ether, and Indian hemp have all been recorded as producing internal-ear

deafness, but generally temporary in character. Constant exposure to loud sounds, such as occurs with boiler-makers and artillery-men, produces deafness of the labyrinthine type, the only treatment being to change the occupation or protect the ears by blocking the meatuses with an obturator of some special material. Caisson-workers, aeronauts, and divers are subject to lesions of the ear, due to changes of atmospheric pressure; and these are aggravated in cases where the Eustachian tube is closed and cannot be opened by swallowing, so as to equalise pressure on either side of the drum.

In caisson-workers the chief trouble seems to arise from too rapid decompression, gas being produced and exudation and hæmorrhage into the internal and middle ear, with giddiness, tinnitus, vomiting, and deafness.

LIFE ASSURANCE.

A few notes on this subject may be of guidance to the practitioner who is called upon to give advice on a given case, but they must only be taken in a general sense, as very great difference of opinion exists on the subject.

1. Lives suffering from suppuration of the middle ear, with perforation, must be postponed till soundly healed, when they must come up for reconsideration.

2. Lives with persistent dry perforation and markedly deaf non-suppurative cases will generally require moderate increase of premium, corresponding, say, to five years.

3. Lives with giddiness of aural origin, if at all severe, should be postponed, heavily loaded, or rejected altogether.

4. Those suffering from ulceration of the external ear should be absolutely rejected if ulceration is malignant, but deferred if due to lupus.

DEAF-MUTISM.

This may be congenital or acquired, and exists in England in about the ratio of 1 in 2000, and is the term applied

to cases in which the hearing is so defective as to prevent the acquisition of speech, or if this has been already acquired, to prevent its preservation. Congenital deaf-mutism is hereditary, and intermarriage between near relations has a marked bearing upon the etiology. Congenital syphilis is also a cause. Congenital deaf-mutes are more common in valleys, in mountainous countries, where food is poor.

In some of these cases, examined post-mortem, the labyrinth has been found to be enlarged, and the branches of the cochlear nerve atrophied.

Acquired deaf-mutism is generally due to meningitis, mumps, or scarlet fever. Congenital syphilis and measles also have a share, with, less frequently, whooping-cough, enteric, and diphtheria. If the deafness has come on before six years of age, the patient will be dumb unless special means be taken by the teacher to preserve his speech.

The diagnosis is made from idiocy in the case of deaf-mutes by the facial expression, which is comparatively bright and intelligent. Most have some islands of hearing still present.

Treatment.—Of course, if any active disease of the ear is still present, such as suppuration, it must be dealt with, or adenoids removed. Since most deaf-mutes have a certain amount of hearing left, treatment lies in endeavouring to develop these remains. Wonderful results are often obtained by the aural method with patients in some cases, but it fails in others, and lip reading or the manual method must be resorted to; but no rule can be made, as each case must be considered individually. The education should be commenced very young. (*Vide*, p. 190.)

Unfortunately, as deaf-mutes naturally associate with each other, they tend to marry, but this obviously should, for the sake of the coming generation, be as far as possible discouraged.

APPENDIX.

GENERAL THERAPY.

THE CAUTERY.

THE galvano-cautery is exceedingly useful in the pharynx, larynx, nose, and less often the ear. Various-shaped burners are employed, according as one desires to produce a punctate, linear, or flat burn; where the space in which it is used is narrow, a burner which is protected on one side is an advantage. It should be used at a cherry-red heat and always separated from the surface before the current is turned off, or it may stick. When this form of cautery is not available, or a very superficial burn is desired, pure carbolic acid, nitrate of silver, chromic acid, or trichlor-acetic acid, applied by means of a platinum wire, are useful. Excessive action of the two latter may be prevented by the application of a solution of bicarbonate of soda and of nitrate of silver by sodium chloride solution.

LOCAL ANÆSTHESIA.

For removing laryngeal growths from the vocal cords the best method is to first swab or spray the palate and post-pharyngeal wall and epiglottis with a 5 per cent. solution of cocaine; and then, by means of a bent tube or special syringe, inject gradually, drop by drop, a solution of 20 per cent., allowing it to run down over the posterior surface of the epiglottis.

For cauterising granulations in the pharynx a 10 per cent. cocaine solution applied by means of a small swab is suitable.

240 DISEASES OF THE THROAT, NOSE, AND EAR

In the nose, for most minor operations, gauze soaked in 10 to 20 per cent. cocaine solution, mixed with an equal quantity of adrenalin solution, 1 in 1000, is applied to the part to be operated on, and left in position fifteen to thirty minutes, the tendency being to operate too soon.

In more extensive and severe operation cases, in which, however, for some reason, a general anæsthetic is objected to, after painting the parts with a 5 per cent. solution of cocaine and waiting a few minutes, a submucous injection is made of from 5 to 10 minims of a solution containing adrenalin, 1 in 10,000, with cocaine 1 per cent., eucaïne 2 per cent., or novocaine 4 per cent.

The point of the needle should penetrate to the bone or cartilage if it is intended to remove either of these. After about ten minutes the parts will be quite anæsthetic. When cocaine has been applied to the throat, peculiar feelings of dryness, lumpiness, and difficulty in swallowing are often complained of by the patient, but soon pass off: marked pallor and faintness sometimes occur and should be treated by lowering the head and the administration of ammonia; serious symptoms of cocaine-poisoning are rare.

With reference to the ear it is not always easy to get satisfactory results with local anæsthesia, the ordinary aqueous solutions of cocaine producing much less effect here than in the throat and nose; but drops containing equal parts of aniline oil and spirit, to which 10 per cent. cocaine has been added, are much more penetrating, as also are those consisting of a mixture of carbolic acid gr. i., menthol gr. i., cocaine gr. ij., in 10 minims of adrenalin solution, 1 in 10,000. But cyanosis has followed the use of aniline; also extensive operations have been performed by injecting cocaine and adrenalin solution hypodermically in the meatal wall; but this is a somewhat painful method and not to be recommended for general use.

DIATHERMY.

This method of raising the temperature of the body has been found possible, owing to the fact that, by reversing with extreme rapidity the direction of a current so strong as otherwise to be fatal to life, only a sensation of heat is produced. This heat, however, may be concentrated by means of small electrodes, so as to obtain cautery effects. Coagulation of albumen first occurs, and, if the treatment be pushed, sloughing; unfortunately, it is difficult at present to accurately gauge the effects produced at the time, so that these have to be more or less guessed at.

This treatment has been made use of with success in destroying malignant growths judged inoperable; also, it has been found useful in lupus. An anæsthetic, either local or general, is necessary for its use, and a good deal of pain is also experienced afterwards; nevertheless, the method forms a useful alternative in cases in which radium and X-rays have failed.

ELECTRICITY.

Electricity is chiefly used in the larynx in the form of the interrupted current, and is the chief therapeutical agent in hysterical aphonia; both poles may be placed extra-laryngeally, or, if this does not succeed, a more powerful result may be obtained by introducing one into the larynx. Both galvanism and faradism are also used in the various paralyses which occur.

RADIUM AND X-RAYS.

Radium and X-rays both appear to have prolonged life in many cases of malignant disease affecting the throat, nose, and ear, even if actual cure has not been obtained.

IONIZATION.

Ionization has proved of some value in the treatment of diseases of these organs, especially in affections of the nose, and I have known obstinate and painful fissures and ulcers here rapidly cured by zinc ionization.

Bier's treatment has been tried a good deal, but apart from the relief of pain I have not seen much gained by its use; caution is necessary.

VACCINES.

A large amount of evidence has now been accumulated, tending to show that vaccines have some curative value in various diseases of the throat, nose, and ear; but fallacies abound, and one must be very careful not to form definite conclusions from insufficient data. Whilst the subject is by no means fully worked out yet, we may say that vaccines certainly appear to do no harm and that disappointment often results from wrong dosage or the wrong organism having been selected for cultivation. A few notes on the subject may, however, be of use.

Apart from tubercular disease and diphtheria the prevailing pathogenic organisms found are chiefly the streptococcus, staphylococcus, *Micrococcus catarrhalis*, *B. septus*, pneumococcus, Pfeiffer's and influenza bacillus. Mixed cultures with more than one predominant organism are common.

Autogenous Vaccines, consisting of a definite number of dead bacteria suspended in a neutral fluid, should, as far as possible, be used, and should be prepared after careful examination of films and cultures on agar or blood agar, every precaution being taken to avoid contamination. To avoid fallacies, as far as possible, repeated examinations should be made. The secretion is collected by means of a sterile tube or swab, and may be blown from the nose, or

spat into a sterile vessel. In the case of the sinuses the nose must first be cleansed.

Sensitised Vaccines, which have been recommended as superior, consist of a pure culture of the patient's organism, which has been treated with the serum of an animal immunized against the same sort of organism, the organism being killed before the vaccination of the patient.

The primary dose consists of a varying number of millions of the killed organism, and is gradually increased if the reaction, which generally consists of some tenderness, redness and swelling at the point of inoculation, with general malaise and nausea, are not too marked. If it is necessary to get the patient rapidly under the influence, increasing doses may be given on three successive days, but in ordinary cases about once a week for from six to twelve weeks is the usual rate. The point of inoculation varies, but the back of the arm is as good as any.

In middle-ear suppuration some successful results have been obtained. In certain cases of acute septic poisoning, affecting the ear, throat, and nose, the disease appears to have been checked and life saved.

In severe colds, both acute and chronic, affecting more or less the whole respiratory tract, vaccines made from the influenza pneumococcus or *catarrhalis* organisms present have apparently cut short some cases, prevented others developing, and protected for a considerable time: also taste and smell may be quickly recovered.

In suppurative disease of the sinuses, *e.g.* the maxillary antrum, encouraging results have been obtained.

The injection of the serum of an animal, immunised against certain organisms, such as the streptococcus, has given good results in some cases.

INHALATIONS.

Inhalations are largely used in the treatment of laryn-

geal disease. They consist either of air, saturated with warm, watery vapour, impregnated with certain drugs, or the vapour of medicaments, mixed with air and used cold. These latter are used in some form of respirator, such as BURNLEY YEO'S, and are called **dry inhalations**.

Much care must be taken to avoid taking a chill after using the hot inhalations, so that these should not be used except when the patient is confined to his room or at bedtime. The warm vapours are chiefly of use in acute laryngitis, the cold in the chronic forms.

Inhalations (Moist).—To be inhaled in the form of warm, watery vapour from a suitable earthenware vessel. For each inhalation, 1 drm. of any one of the following formulæ should be used with 1 pint of water at a temperature of 140° Fahr.:

R Acid. Carbol. Liq ʒiv Glycerin. ad ʒi.	R Tinct. Iodi Fort., ℥lxxx Aque Destill ad ʒi.
R Tinct. Benz. Co., ʒi	R Menthol., gr. xvi Spirit. Rectif ad ʒi.
R Creosot., ℥xl. Mag. Carb. Levis., gr. xx. Aque Destill. ad ʒi.	R Ol. Pini (B.P.), ℥xl. Mag. Carb. Levis., gr. xx. Aque Destill ad ʒi.
R Ol. Eucalypti, ℥xx. Mag. Carb. Levis., gr. x. Aque Destill. ad ʒi	R Thymol., gr vi. Spirit Rectif., ʒi. Mag. Carb. Levis, gr. iij Aque Destill. ad ʒi.
R Ol. Eucalypti, ℥xx. Ol. Pini (B.P.), ℥xl. Tinct. Benz. Co. ad ʒi	

Inhalations (Dry).—Ten drops of any one of the following formulæ to be used in an oro-nasal inhaler:

R Creosot, ℥lxxx Spirit. Rectif. ad ʒi	R Ol. Eucalypti, ℥lxxx. Spirit. Rectif. ad ʒi.
R Ol. Cinnamon., ʒij. Spirit. Rectif. ad ʒi.	R Iodi, gr. iij. Æther pur., ʒij Phenol., ʒij. Spirit. Rectif. ad ʒi.
R Ol. Eucalypti, ʒij Tinct. Benz. Co., ʒiij. Thymol., ʒi. Spirit. Chlorof ad ʒi.	R Ol. Pini (B.P.), ʒi. Ol. Eucalypti, ʒi. Tinct. Benz. Co., ʒij. Creosot ad ʒi.

Nascent Chloride of Ammonium Vapour, inhaled from a special apparatus designed for the purpose, may often be employed in cases of catarrhal conditions of nose and throat.

Several patterns of these Ammonium Chloride Inhalers are obtainable (Burroughs & Wellcome's; Godfrey & Cooke's; Maw's, etc.).

GARGLES.

Gargles are very popular with the laity, but have the disadvantage, on the one hand, of disturbing the parts a good deal, and, on the other hand, of often not reaching the part for which they are intended. Their efficiency, however, is much increased by practice, an expert gargler being able to allow the fluid to pass quite a long way down without swallowing it. They are not suitable for very acute affections.

GARGLES AND MOUTH-WASHES.

R Acid. Boric., gr. x. Aque Destill. ad ℥i.	R Liq. Hydrogen. Perox. (10 vols.), ℥ij. Aque Destill. ad ℥i.
R Acid. Tannic, gr. v. Alum, gr. v. Acid. Carbol. Liq, ℥i. Glycerin, ℥xv. Inf Rosæ. Acid. ad ℥i.	R Listerin., ℥i. Aque Destill. ad ℥i
R Formalin, ℥i. Aque Destill. ad ℥i.	R Potass. Chlor., gr. x. Acid. Hydrochlor dil., ℥x. Glycerin, ℥xx. Aque Destill. ad ℥i.
R Glycerin. Thymol. Co., ℥ij. Aque Destill. ad ℥i.	R Potass. Chlor., gr. v. Sodii Bibor., gr v. Sodii Bicarb., gr. v. Aque Destill. ad ℥i.
R Hydrarg. Perchlor., gr $\frac{1}{2}$. Glycerin, ℥ss. Aque Destill. ad ℥i.	

LOZENGES.

Lozenges are largely used, but one must always remember that their action is not only local, but, being swallowed, is also general, which may or may not be desirable.

LOZENGES.

TROCH. *vel* PASTILL.

Acid. Benzoic.	containing gr. $\frac{1}{2}$ of medicament.
Acid. Carbol.	„ gr. $\frac{1}{4}$ „
Acid. Tannic.	„ gr. $\frac{1}{2}$ „
Ammon. Chlor.	„ gr. 2 „
Cocain	„ gr. $\frac{1}{20}$, $\frac{1}{10}$, $\frac{1}{5}$, $\frac{1}{4}$ „
Eucalypti (Red Gum) (Ol. Eucalypti) „	gr. 1 „
Guaiaci	„ gr. 3 „
Heroin	„ gr. $\frac{1}{20}$ „
Krameria	„ gr. 1 „
Menthol.	„ gr. $\frac{1}{20}$, $\frac{1}{10}$, $\frac{1}{5}$ „
Potass. Chlor.	„ gr. 3 „

TABLET.

Formaldehyde (B.P.C.) ; Formalin, $\mathfrak{M}\frac{1}{2}$.

Many useful combinations of above medicaments may be used, such as Heroin \bar{c} Cocaine, Krameria \bar{c} Cocaine, Menthol \bar{c} Ol. Eucalypt. ; Menthol, Ol. Eucalypt. \bar{c} Cocaine ; Potass. Chlor. Borax \bar{c} Cocaine ; etc.

SPRAYS.

A douche is very rarely used for pharyngeal or laryngeal affections, but a coarse spray is of great utility. This may

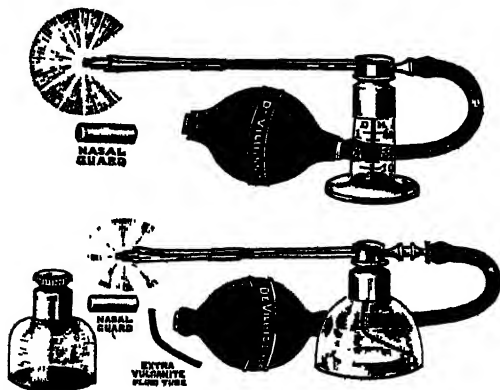


FIG. 87.—DE VILBISS SPRAYS.

be effectively applied by means of an atomiser, such as the de Vilbiss, in which the nozzle can be directed forwards, upwards, or downwards. Atomisers used for watery solutions

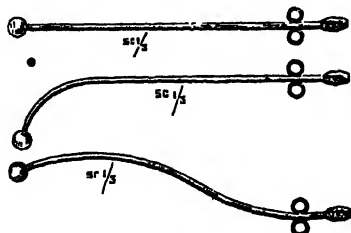


FIG. 88.—NOZZLES WHICH MAY BE ATTACHED TO AN ORDINARY EAR SYRINGE BY RUBBER TUBE AND USED FOR WASHING OUT THE THROAT, NOSE, AND EAR BY MEANS OF A COARSE SPRAY.

of salts should always be carefully washed through with water after use, or they are liable to get clogged. Partly for this reason, for some time past, when wishing to get a coarse spray, I have used an ordinary ear-syringe with a metal

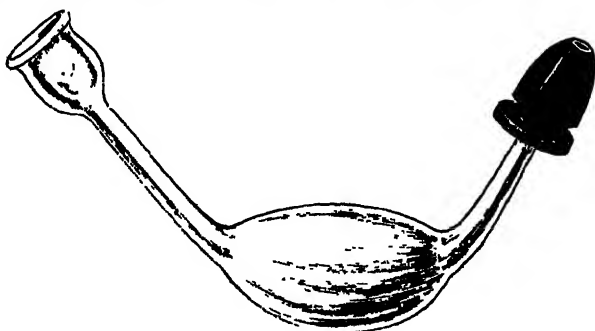


FIG. 89.—WOAKES NASAL IRRIGATOR.

nozzle, somewhat like that of the familiar watering-can, attached by means of a piece of rubber tube and so easily removable for sterilisation; by this means an effectual cleansing of the nose, post-nasal space, larynx, and pharynx, may be obtained. There are a few cases in which a more extensive wash-out may be necessary, as in suppuration of the maxillary

antrum or *ozæna*. In these cases it is better to use a Higginson's syringe than the continuous flow from a suspended vessel, which entails more risk of setting up acute inflammation in the middle ear. In either case the patient should not speak or swallow during the operation, but breathe steadily through the mouth, the nozzle being introduced for choice into the less patent side of the nose.

Other methods of applying watery solutions to the nose employed by patients are by snuffing up the liquid from the hand, tablespoon, small bowl or boat, or by means of a small syringe. These procedures, however, should always be supervised by the surgeon, not only to see that they are effectively carried out, but also because there is a tendency on the part of patients to continue this form of treatment for long and indefinite periods, thereby damaging the mucous membrane with its delicate ciliated epithelium.

Oily solutions are applied by means of an atomiser, small swab, or brush.

NOSE-WASHES.

R	Ammon. Chlorid., gr. v. Sodii Chlorid., gr. iij. Sacch. Alb., gr. v. Aque Destill. ad ℥i.	R	Sodii Bibor., gr. iij. Sodii Bicarb., gr. iij. Sodii Chlorid., gr. iij. Aque Destill. ad ℥i.
R	Boroglyceride, gr. xxx. Aque Destill. ad ℥i.	R	Sodii Bicarb., gr. iij. Sodii Bibor., gr. iij. Acid. Carbol. Pur., gr. .
R	Glycerin. Thymol. Co., ℥ij. Aque Destill. ad ℥i.		Glycerin., ℥x. Aque Destill. ad ℥i

The above could be prescribed double strength and used with an equal quantity of warm sterile water.

Many useful nose-wash formulæ can also be prescribed in the form of compressed tablets, with directions to the patient to dissolve in warm water for use.

A great variety of these "Nasal Tablets" are prepared by manufacturing chemists and issued in bottles of 25 and 100, etc. As a rule one tablet will make 2 or 3 ounces of solution of suitable strength for a nose wash.

SPRAY SOLUTIONS
 (NEBULÆ).
 (AQUEOUS.)

- R Sol. Adrenalin Hyd. (1 in 20,000 to 1 in 5000), ʒij
- R Sol. Cocain. Hydrochlor. (1 per cent. to 5 per cent), ʒij.
- R Sodii Bicarb., gr. v.
Sodii Bibor., gr. v
Acid. Carbol. Pur., gr. i.
Glycerin., ℥xv.
Aque Destill. ad ʒi.
- R Glycerin. Acid. Tannic, ℥xxx.
Aque Destill. ad ʒi.
- R Glycerin. Thymol. Co., ʒij.
Aque Destill. ad ʒi.
- R Spirit. Rectif., ʒi.
Glycerin. Boracis., ʒi.
Aque Destill. ad ʒi.

 SPRAY SOLUTIONS
 (NEBULÆ).
 (OILY.)

- R Coryfin (Bayer), ʒi to ʒij.
Paraff. Liquid. ad ʒi.
- R Ol. Eucalypti, ℥xx
Paraff. Liquid. ad ʒi
- R Menthol., gr. v to gr xxx.
Paraff Liquid ad ʒi.
- R Menthol., gr. x.
Camphor., gr. v.
Chlorbutol., gr. v.
Paraff. Liquid ad ʒi.
- R Menthol., gr. x.
Ol. Eucalypt., ℥x.
Cocain. Alk., gr iv
Paraff Liquid. ad ʒi

PAINTS.

Paints are largely used as throat applications, and are best applied on cotton-wool swabs. A special swab-holder may be employed, or the wool may be made to adhere to the end of a probe by damping the end of the latter and then twisting the pledget of wool round it. Patients, however, show a tendency to stick to the more septic brush as of yore.

PIGMENTS.

- R Glycerin. Boric (B.P.C.), ʒi.
- R Glycerin. Acid. Carbol., ʒij.
Glycerin. ad ʒi.
- R Glycerin. Acid. Carbol., ʒij.
Glycerin. Acid. Tannic ad ʒi.
- R Acid. Chromic, gr. x.
Aque Destill. ad ʒi.
- R Glycerin. Acid. Tannic. (B.P.), ʒi.
- R Glycerin. Alum., ʒiv.
Glycerin. Acid. Tannic. ad ʒi.
- R Liq. Alumin. Acet., ʒij.
Glycerin, ʒi.
Aque Destill. ad ʒi.
- R Argent. Nit., gr. x.*
Aque Destill. ad ʒi.
- R Iodi, gr. vi.
Potass. Iodid., gr xx.
Ol. Menth. Pip., ℥v.
Glycerin. ad ʒi.
(Pigmentum Mandl)
- R Menthol., ʒi
Paraff. Liq ad ʒi.
- R Zinc Chlorid., gr. x.
Acid. Hydrochlor. dil., ℥i.
Aque Destill. ad ʒi.

* Other strengths according to requirements.

DROPS.

Drops are chiefly used in the treatment of ear disease, and may be applied by means of a dropper or sterilised spoon. They should preferably be warmed before being introduced, and they may be placed in the bowl of a small spoon which has just previously been sterilised in boiling water and allowed to cool. The patient should bend his head well over the opposite side, and the auricle drawn well back, and a few (five to ten) drops poured in. After five minutes the head is turned over and the excess of drops allowed to escape, after which the meatus is carefully dried with cotton-wool. If, however, a more liquefying effect be required, as in the case of wax, after the drops have been instilled a pledget of wool is inserted to retain them.

DROPS**FOR INSTILLATION.**

R Acid. Chromic., gr. v. Aque Destill. ad ʒi.	R Sol. Cocain. Hydrochlor (5 to 10 per cent. in Aq. Dest.), ʒi.
R Alcohol (20 per cent. to 90 per cent.), ʒi.	R Liq. Hydrogen. Perox (10 vols), ʒi.
R Alcohol (90 per cent.), ʒss Sol. Acid. Boric. (1 in 25), ʒss.	R Sodii Bicarb., gr. xv. Aque Destill. ad ʒi.
R Glycerin. Acid. Carbol., ʒij. Glycerin. ad ʒi.	R Paraffin. Liq., ʒss.

OINTMENTS.

Ointments are used chiefly in the nose and external auditory meatus, and are applied by means of a cotton-wool swab or small brush.

OINTMENTS.

R Acid. Boric. (pulv.), gr. xlvij.	R Menthol., gr. v.
Paraff. Moll. Alb. ad ʒi.	Acid. Boric (pulv.), gr. v.
R Hydrarg. Ammoniat., gr. xx.	Paraff. Moll. Alb. ad ʒi.
Paraff. Moll. Alb. ad ʒi.	R Menthol., gr. v.
R Ung. Hydrarg. Nit. (B.P.), ʒss.	Ol. Eucalypt., ℥x.
Paraff. Moll. Alb. ad ʒi.	Cocain. (Alk.), gr. v.
	Paraff. Moll. Alb. ad ʒi.

POWDERS.

Powders are but little used in the pharynx, and in the larynx not so much as formerly. To introduce them into the latter the patient should hold out his own tongue by means of a cloth, whilst the surgeon holds the laryngeal mirror in his left hand and the charged insufflator in his right. Having got the beak in the right position, he presses the rubber ball or piston and so injects the powder. A little practice will be required before good shooting is obtained, as it is difficult to keep the instrument quite steady whilst firing.

In painful affections, *e.g.* some forms of tubercular disease, the insufflation of sedative powders, such as orthoform and anæsthesin, gives great relief. In order that the powder may enter the larynx one must see that the point of the instrument is behind the epiglottis, and if it be desired to apply the powder to the vocal cords the patient should say "Ah" whilst it is being blown in.

By means of a glass tube (Leduc's), one end of which contains the drug and the other is placed by the patient at the back of his pharynx, he is enabled, by inspiring, to suck the powder into his own larynx, his lips being closed round and firmly gripping the middle of the tube.

As regards the ear, the great thing against powders is their tendency to block up the meatus or middle ear, so interfering with drainage; therefore, there are very strong objections to any insoluble powder, and consequently the one most used in ear work is boracic acid. This, when used, should be blown in from an insufflator, care being taken to coat the parts with only a thin film. In cases of middle-ear suppuration, which depend for their drainage on just a small perforation, powders should never be used at all.

INSUFFLATIONS (AURAL).

R Acid. Boric (pulv.). ʒi.

R Iodoform., gr. xx.
Coumarin., gr. i.
Acid. Boric. (pulv.) ad ʒi.

INSUFFLATIONS (LARYNGEAL).

R Anæsthesin.

R Morphinae Hydrochlor., gr. $\frac{1}{8}$.
Pulv. Amyli., gr. v.R Anæsthesin., ʒss.
Orthoform., ʒss.R Resorcin., gr. xx.
Orthoform. ad ʒi.

All above medicaments to be in very fine powder. About 1 grain of either of the aural formulæ is sufficient for each ear insufflation, while up to about 5 grains of the laryngeal formulæ can be used for the throat.

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